

**State of California
The Resources Agency
DEPARTMENT OF WATER RESOURCES**

FINAL ENVIRONMENTAL IMPACT REPORT

**ARTIFICIAL RECHARGE, STORAGE AND OVERDRAFT
CORRECTION PROGRAM
KERN COUNTY, CALIFORNIA**

(KERN WATER BANK)

December 1986

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Secretary for Resources
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**George Deukmejian
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NOTE:
Changes to the Final Environmental Impact Report
are in italic type.

FOREWORD

The State Water Project (SWP) was authorized by the Legislature and approved by the voters more than 25 years ago. Although the major features of the SWP are in place, it is only partially completed. Depending on a number of factors, the SWP currently has *the capability to deliver* only 50 to 75 percent of the contractors' maximum annual entitlement. Additional *water storage* facilities are needed in order to meet future entitlement requests and to compensate for area-of-origin depletions.

One method to increase the dependable supply of the SWP is to store surplus water in ground water basins during years of abundant supply for extraction and use in dry years. The proposed Kern Water Bank project involves direct and in-lieu recharge and the acquisition of land on which artificial ground water recharge *facilities* would be *constructed* and operated. Additional aspects of the land acquisition proposal include (1) reducing ground water overdraft by reducing irrigation in the area and (2) enhancing local wildlife habitat.

In concept, the Kern Water Bank could include projects involving a major portion of the Kern County Ground Water Basin. The first element (project) proposed for the Kern Water Bank is the purchase of land situated along the Kern River and southwest of the City of Bakersfield for the purpose of direct recharge and extraction of SWP water. Because many of the details of the proposed project have yet to be completed, a program Environmental Impact Report (EIR) format has been used. This program EIR focuses on the impacts of land acquisition. Concurrent with the program EIR process, prefeasibility studies are being made, and the results of these studies will be reviewed, along with this document, before making a decision to purchase all or a portion of the property available for a ground water storage project.

If a decision to purchase is made, it will be followed by full engineering, economic, and financial feasibility studies of a ground water storage program. If *significant* additional environmental consequences are indicated which are not described in the program EIR, then an Initial Study will be required, followed by an EIR or Negative Declaration. Otherwise, the activity can be approved as being within the scope of this program EIR and additional environmental documentation will not be required.

Concurrent with the feasibility study of the first element proposed for the Kern Water Bank, a prefeasibility study to evaluate the desirability of integrating all proposed additional elements into the Kern Water Bank will be conducted. This will allow the Department of Water Resources to develop an overall plan and select additional elements for future feasibility studies. Additional EIRs will be issued to cover each of the additional direct and in-lieu recharge projects as part of the feasibility studies of these elements of the Kern Water Bank.

The draft program EIR, dated May 1986, was reviewed and commented on by SWP contractors, local agencies, and other interested parties. The comments and DWR responses are listed in the final chapter of this report. As a result of the comments, some portions of the draft EIR were deleted, and some text (in italics) and figures were added.

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SUMMARY

The California Department of Water Resources (DWR) proposes to operate a ground water basin recharge, extraction, and storage project in Kern County. This project, the Kern Water Bank, will consist of *several elements*. The first *element* proposes to acquire up to 46,000 acres of land for the purpose of recharging, extracting, and storing State Water Project (SWP) water *in the Kern River Fan area*. *Additional elements are proposed to accomplish the same goals elsewhere in Kern County through both direct and in-lieu recharge projects*. This program Environmental Impact Report (EIR) deals with the *general effects of the program and the general effects of the land acquisition necessary for the first element*. The *in-lieu and additional direct recharge projects* will be the subject of separate EIRs.

The proposed action of *implementing the first element* could increase SWP firm yield about 160,000 acre-feet annually for the State Water Project and reduce ground water overdraft in Kern County by up to 70,000 acre-feet annually. In addition, the proposed project could enhance wildlife *habitat* in the area. There would be the potential for developing intermittent wetlands and/or revegetating agricultural lands with native vegetation. Both would restore habitat for threatened and endangered species. This report identifies and analyzes the significant effects of acquiring *and managing* the lands needed for the recharge program and compares them to the consequences of the "No Project" alternative.

Purpose and Need for Action

The purpose of the artificial recharge, storage and overdraft correction program being proposed is to increase the available water supply of the SWP *by storing SWP water in the Kern County Ground Water Basin during wet years and by withdrawing the stored imported water during dry years*. *An additional purpose is to reduce overdraft in the Kern County Ground Water Basin*. The conjunctive operation of existing SWP facilities with ground water basins would help increase supplies of water to meet contractor requests and *reduce* future deficiencies.

Currently there are local agency projects that recharge the ground water basin with both local and imported supplies. It is the purpose of the proposed project *to increase the firm yield of the SWP through conjunctive use of the ground and surface waters, while not diminishing the benefits of existing local projects*. *An additional project purpose being negotiated is increased recharge capability for local supplies*.

Using available ground water storage space provides several advantages over constructing new surface water facilities, including reduced evaporation, lower *capital investment*, generally greater environmental acceptability, and reduced need for extensive distribution systems.

Since 1960, DWR has contracted with 30 public agencies to deliver SWP water. These agencies supply water to more than two-thirds of the population of the State and to thousands of acres of land used for irrigated agriculture. The contracts call for a progressive increase in the amount of annual entitlement water deliveries to the contractors, up to a maximum of 4.22 million acre-feet of firm yield.

The current firm yield of existing SWP facilities is approximately 2.35 million acre-feet per year. By 1990, assuming no further augmentations other than completion of overland water supply facilities on Sherman Island in the western Delta, the estimated SWP firm yield will decline to 2.30 million acre-feet per year. Further declines during 1990-2000 should be offset by the additional pumping capacity of the final four units at Harvey O. Banks Delta Pumping Plant; thus the firm yield of existing and scheduled SWP facilities in 2000 is also projected as 2.30 million acre-feet per year.

Future delivery shortfalls are of particular significance to contractors having agricultural water supply entitlements. In years of deficient SWP supply, Article 18(a) of the standard SWP water supply contracts provides:

- that *reductions in water deliveries shall be imposed first on agricultural water users*. The portion of the contractor's annual entitlement that is used for agricultural purposes would be reduced by as much as 50 percent in any given year or a total of 100 percent in any series of seven consecutive years *before reductions are imposed on all water users*; and
- if further delivery reductions are required, the deliveries to all contractors are reduced by the same percentage without regard to the use of the water.

In times of SWP delivery shortage, agricultural contractors experience the first and largest reductions in deliveries. *Although*, the agricultural contractors will *initially* be the principal beneficiaries of new projects (surface or ground water) that increase SWP water supply *reliability*, *urban contractors will become the greater beneficiaries after the mid-1990s*.

Description of the Proposed Action

The proposed project involves the *first step toward implementation of the program with emphasis on the acquisition of lands on which an artificial recharge project may be designed, constructed, and operated to store SWP water in the ground in years of abundant supply for later extraction and use in years of deficient supply*. This operational mode will help reduce future shortages and help correct long-term overdraft conditions in the Kern County Ground Water Basin.

The ground water recharge and storage program will require construction of various physical facilities to spread water for ground water recharge, to convey water to and from the storage site, and to extract *SWP water previously stored* underground.

Preliminary analysis of the project has focused on a total recharge amount of 40,000 acre-feet per month. Assuming a sustainable recharge rate of 0.5 acre feet per acre per day, about 2,700 acres of active recharge basins would be needed. *Ongoing studies are using a range of recharge rates of 0.33 to 0.5 acre-feet per acre per day. An additional 800 acres of basins are required for basin rotation, cleaning, and drying. If coordinated operation with the City of Bakersfield facilities can be achieved, it may be possible to reduce the required basin area for the State project to 1,600 acres.* The basins would likely be located in the more permeable soils in the northern and eastern portions of the project site and at some distance from the existing recharge program of the Rosedale-Rio Bravo Water Storage District (WSD).

The SWP recharge supplies would be conveyed to the spreading basins via a newly constructed canal and possibly through existing canals having available capacity. Both existing and new wells will be used to recover stored SWP water. The preliminary estimate of extraction from the *stored* water is up to 30,000 acre-feet per month during dry periods.

Preliminary operation studies of the SWP system were performed at the 1990 level of demand and development, and the hydrology from the 1922 to 1978 period to determine the amount of water that could be made available for storage, the times when extraction from storage would be required, and the amount of increased SWP delivery that would be available through conjunctive operation.

In a preliminary study of year 1990 conditions, assuming a maximum recharge rate of 40,000 acre-feet per month, recharge to the basin occurred in 20 years over the 57-year hydrologic period

from 1922 to 1978. The amount of annual recharge varied from 20,000 acre-feet to 480,000 acre-feet. Extractions occurred in 26 years during the same period and varied from 150,000 acre-feet to the maximum annual withdrawal of 330,000 acre-feet.

Significant Effects of the Proposed Action and Mitigation

Table S-1 lists the environmental impacts of the proposed action and mitigation measures needed to reduce the significant adverse effects to a level that is less than significant. Environmental effects considered to be less than significant and beneficial effects also are included in the table.

TABLE S-1

SUMMARY OF ENVIRONMENTAL IMPACTS AND MITIGATION

A. Potentially Significant Environmental Effects

Impact Category	Impacts	Mitigation
Ground Water Levels	Interference with adjacent local recharge projects.	Closely monitor ground water levels under the project site to allow adjustments in recharge rates to prevent excessive mounding. Schedule recharge in project area at a different time than that of adjacent local projects. Site facilities to spread water level increases as evenly as possible over the project area to minimize interference.
Fish	Projected operation will result in greater fluctuations than would otherwise occur. During periods of maximum drawdown by the State Water Project, water levels on adjacent lands would be about 20 feet lower than in the absence of the project.	Piezometers and production wells will be used to monitor water levels in the project area and adjacent lands. Surface distribution systems could be expanded to lessen the need for local pumping during periods of heavy extractions. If data indicate that excessive water level rises may occur, recharge activities will be modified as appropriate.
Wildlife	Potential to inadvertently introduce white bass into the conveyance system which could find their way to the Delta with resulting adverse effects on the Delta fishery. The spreading basins may provide conditions conducive to waterfowl botulism production.	Periodically sample percolation ponds and conveyance system; institute control measures if white bass are found. The Department of Fish and Game on methods of construction and operation and maintenance of the percolation ponds during periods when avian botulism would be expected.
Cultural Resources	Excavation during construction could impact cultural resources within the project area.	Rafting could be controlled by allowing hunting access to percolation ponds during hunting season. Field surveys will be conducted for ground water recharge basins; a qualified archeologist will be asked to determine the significance of any find unearthed during construction.
Air Quality	Temporary increase in vehicle emission and dust during construction. Routine maintenance may also generate increased dust.	Eliminate agricultural production on portions of the project lands during construction. By doing this, the level of impact would be no greater than what would be encountered during disking.
Water Quality	Water used for recharge will have a slightly higher salinity. Average boron concentration would be less than existing ground water.	Water quality will be carefully monitored during the recharge process with special attention to possible bioaccumulation of trace elements. In the event that significant water quality degradation occurs, project operations could be modified to minimize the movement of water.

B. Environmental Effects Considered Less Than Significant

TABLE S-1 (cont.)

SUMMARY OF ENVIRONMENTAL IMPACTS AND MITIGATION

Impact Category	Impacts	Mitigation
Income/Employment	Loss of income and employment caused by the removal of land from production.	Lease lands for other purposes.
Property Tax	Loss of County property taxes due to State ownership.	If the lands are leased, Kern County will collect a possessory tax from the tenants.
Land Use	Agricultural production on the project lands would be removed with accompanying effects on income and employment.	Income and employment losses could be reduced if the State leased some acreages for non-irrigated crops such as wheat or barley.
Valley Fever	Kern County will experience a loss of revenue because the proposed project lands will be placed in State ownership. Potential exposure to Valley Fever.	If the State leased all or portions of the land for non-irrigated agriculture then Kern County could collect a possessory interest tax from the tenants.
Energy	Increased energy use to convey Aqueduct water to the recharge sites and to extract stored ground water. Increased energy needed to operate the SMP because of greater delivery capability in dry periods.	The risk of contracting Valley Fever is no greater during project construction than during farming activities. Construction workers should be advised of the potential risk as a condition of employment.
Overdraft Correction	Beneficially impact local ground water quantity. Also will result in reduced pumping lifts and may lessen the future land subsidence in areas outside the project.	The additional energy required by the project would be obtained from sources identified in the Department of Water Resources' long-range energy program which ensures energy for operation of the State Water Project. The energy needed will be obtained from both hydroelectric and thermal sources.
Water Quality	Since water levels will be higher than in the absence of the project, will inhibit the migration of poorer quality water from the west side into project area. Also will result in reduced pumping lifts and may lessen the future land subsidence in areas outside the project.	
Wildlife Enhancement	Waterfowl habitat could be created in several areas where permeability rates are conducive to ponding water for long periods of time.	
Vegetation	Habitat for several threatened or endangered species known to inhabit the area would be enhanced. The project could potentially enhance the native vegetation in areas not used for recharge basins. These lands would be allowed to revert to more natural conditions.	

C. Beneficial Effects

Alternatives

Five alternatives to the proposed action were considered. These alternatives are:

Alternative 1. North of Taft Highway Recharge Project

This alternative involves acquiring about 30,000 acres of land north of Taft Highway for use in the recharge program. Project facilities required and *increased firm yield (about 160,000 acre-feet per year)* would be the same as for the proposed action. Construction and operation impacts would be the same. Irrigated agriculture south of Taft Highway would not be affected. The overdraft correction benefits of removing about 20,000 acres of the 30,000 acres from production would be up to 50,000 acre-feet per year, rather than the 70,000 acre-feet under the proposed plan. The SWP ground water storage operations may have a larger impact on adjacent ground water users than would occur in the proposed action. Loss of tax revenue would be less than that described for the proposed action. Lands not used directly for recharge basins would be allowed to revert to native vegetation and/or be developed as wetlands. This land use change would be beneficial for wildlife.

Alternative 2. 3,500-Acre Recharge Project

Alternative 2 involves purchasing the 3,500 acres needed for recharge ponds and obtaining easements to construct necessary conveyance and extraction facilities. *Location of facilities would be similar to Alternative 1.* Theoretically, the yield increase would be the same as under the proposed action. Irrigated agriculture would continue in areas outside of the 3,500-acre recharge site and would continue to depend primarily on pumped ground water. Overdraft correction benefits would not occur. Ground water levels would decline at the same hydrologic rate as without the proposed action, *resulting in increased* energy use and cost of ground water pumping. No additional areas would be available for terrestrial wildlife enhancement. In wet years, waterfowl habitat would be provided in the recharge areas. *The owners of the property have indicated they wish to sell the property, and easements are not available. Lack of control over land use and failure to reduce local extraction may make the project unacceptable to local interests. Purchase of strips of land for access and well sites would cause severance damage.*

Alternative 3. KCWA Ownership Of Project Site

Kern County Water Agency (KCWA) would purchase the project site either directly from Tenneco West Incorporated or at a later date from DWR. DWR would contract with KCWA to operate the ground water storage program on the site. Project impacts would be the same as described for the proposed action.

Alternative 4. Los Banos Grandes Reservoir

The construction and operation of Los Banos Grandes Reservoir *has been suggested* as an offstream surface storage alternative to the proposed action. This *proposal could complement the Kern Water Bank and is also being evaluated* as a separate addition to the SWP, either with or without the proposed ground water project. The reservoir would store excess water pumped south from the Delta through the California Aqueduct, primarily during the wet winter months. Stored water would be released at times when pumping from the Delta is restricted.

Except for water supply, this alternative would have impacts similar to the No Project alternative. There would be no overdraft correction or wildlife enhancement benefits and no impacts on Kern County employment or tax revenue. Los Banos Grandes could have significant environmental im-

pacts. However, should the project be constructed, appropriate mitigation features would be included.

Alternative 5. No Project

The No Project alternative involves the continuation of existing land use. No SWP recharge facilities would be constructed.

Chapter 1. PURPOSE AND NEED FOR ACTION

Uses of the EIR

The Department of Water Resources (DWR) is considering options to develop additional sources of water that will reduce delivery deficiencies and firm up existing contractual rights to SWP contractors. One method to increase the dependable supply of the SWP is *to use ground water basins for the storage of surplus Delta flows and for reregulation of SWP water stored in surface reservoirs*. There are two ways by which this can be accomplished: in-lieu recharge and water spreading. The direct artificial recharge of SWP water *proposed in the first element of the Kern Water Bank* will require the acquisition of property.

This report identifies and analyzes the significant environmental effects of acquiring a parcel of land in Kern County to develop a conceptual ground water storage program that is designed to increase the SWP water supply. *The property being considered is being offered for sale by Tenneco West Incorporated (TWI)*. Because many of the details of constructing a specific physical project have yet to be completed, a program EIR has been prepared. *The proposed action addressed in this program EIR is designated as the Kern River Fan Element of the Kern Water Bank (KWB)*. The EIRs' for in-lieu and additional direct recharge proposals would be done concurrently with feasibility studies for such projects.

This program EIR focuses *mostly* on the purchase of lands *and the resulting changes in land use* that would be required for a ground water recharge and extraction operation. It does not preclude consideration of any other actions or a combination of them (including surface storage facilities) as a means of increasing SWP deliveries and/or optimizing the efficiency of local recharge operations.

Within Kern County, several additional projects have been proposed that could increase water supply during dry periods. While some of the ground water options do not require land acquisition they would require separate feasibility studies and EIRs before proceeding. Proposals such as those of Rosedale-Rio Bravo Water Storage District (WSD), Arvin Edison WSD, *Improvement District No. 4, Kern Delta WSD, Semitropic WSD, and others* could be included in the overall ground water storage program to achieve increased SWP and local efficiency. *Four examples of possible additional elements follow.*

Rosedale-Rio Bravo WSD proposes to develop a surface water distribution system in the western part of the district that could receive water from the East Side or Cross Valley Canal that could be used for in-lieu ground water recharge. The project would include well fields in the area that could extract stored water in dry years for delivery back into the Cross Valley Canal.

Arvin Edison WSD and the Metropolitan Water District of Southern California (MWD) are discussing a potential ground water storage program in the eastern and southern portion of the Kern County basin. In some years MWD would deliver a portion of its SWP entitlement to Arvin Edison WSD for direct recharge or delivery to irrigators in lieu of ground water pumping. In dry years, MWD would receive up to 128,000 acre-feet of Arvin Edison WSD Central Valley Project exchange water while Arvin Edison WSD would rely on previously banked MWD water. The CVP water *would be wheeled* through the California Aqueduct on a space available basis under a contract that will expire in 1996.

The program proposed by Semitropic WSD includes the delivery of an unspecified amount of surface water to landowners in the district in return for reduction of ground water pumping. The SWP would be expected to pay for improvements to Semitropic's distribution system and for construc-

tion of wells capable of pumping 50,000 acre-feet during a six-month period. Annual extractions from storage for SWP use would be restricted to 15 percent of the water in storage, up to a maximum of 50,000 acre-feet annually.

The Buena Vista WSD (including the Henry Miller W. D.) covers about 75,000 acres. Basic water supply from the Kern River is conveyed via the lined River and Alejandro Canals, regulated by the Buena Vista Aquatic Lake and then conveyed through the Maples and Outlet Canals. Major service is from the Outlet Canal to an unlined gravity canal system serving 45,000 acres. The District has an allocation from KCWA of 25,000 acre-feet of SWP water, part of which is exchanged for river water. Three alternatives have been suggested: (1) delivery of SWP water for pre-irrigation during January-March when river water is short, thus avoiding well turn-on; (2) delivery of SWP water during the summer as a substitute for pumpage; and (3) improvement of spreading works and percolation of SWP water during off-peak demand periods. Average recharge credits for these programs are estimated to be 16,000, 2,000, and 3,000 acre-feet per year, respectively. Recovery would be through new SWP wells probably located along existing canals which could convey water to the California Aqueduct or local districts.

The DWR plans to complete the EIR process and evaluate engineering, economic, financial, and institutional considerations at a *prefeasibility level* before recommending the proposed land acquisition. The DWR and KCWA will also need to consider the EIR before entering into a *Memorandum of Understanding* and a contract concerning the facility, as required by SB 187 (Ayala) of 1985, Chapter 268 of the Statutes of 1985. *The DWR and the City of Bakersfield will also need to consider this EIR before entering into a Memorandum of Understanding or a contract for joint use of recharge facilities.* If contracts are executed with any member units in KCWA, the member units will also need to consider this EIR.

The exact locations of the physical facilities to spread water for ground water recharge, to extract water from ground water storage, and to convey water from the storage sites will need to be *more specifically* determined. *Prefeasibility studies are being made that include SWP system operation studies, ground water model studies, and economic analyses. The results of these studies will be reviewed by DWR and the SWP contractors before a decision is made to purchase all or a portion of the property. Full feasibility studies planned to begin after a decision is reached to purchase the property, will include ground water modeling, geological exploration, and other site-specific activities to determine the best way to design and operate the proposed project. Concurrently, a prefeasibility study will be made of the region to evaluate all proposals so that conveyance facilities located on the TWI property will fit into future regional needs.*

This information will be examined by DWR (the Lead Agency) and Responsible Agencies with respect to the program EIR to determine whether a supplemental environmental document must be prepared. If the subsequent activity would have significant environmental consequences that were not described in the program EIR, a new initial study would then be required, leading either to a site-specific EIR or to a Negative Declaration. If no new significant environmental effects could occur or no new mitigation measures would be required, then the activity can be approved as being within the scope of the project covered by the program EIR and additional environmental documentation would not be required.

Purpose of the Proposed Project

The proposed project involves the acquisition of lands on which an artificial recharge project may be designed, constructed and operated to store SWP water in years of abundant supply for later extraction and use in years of deficient supply. With this operation, the project will increase the

delivery capability of the SWP and help reduce future shortages. The project also will help correct long-term overdraft conditions in the Kern County Ground Water Basin by (1) increasing the reliability of imported water supplies, (2) eliminating the demand for irrigation supplies on *purchased* project lands that are presently supplied by pumped ground water, and (3) *making additional facilities available for recharge of local water through cooperative agreements*. Finally, the project will be operated to achieve the increased efficiency that will result from the conjunctive operation of existing SWP facilities with ground water storage. This conjunctive operation can provide significant quantities of water at a unit cost that will be lower than or competitive with *known* surface water development alternatives.

Using available ground water storage space has many advantages over construction of a new surface storage facility. Ground water storage reduces evaporation, *has a lower capital cost*, usually does not require an extensive distribution system, and is generally more environmentally acceptable than surface storage. An imported ground water storage program would reduce pump lifts for other pumps in the basin while the water is in storage.

Need For Additional Dependable Water Supply

The SWP (once called "The Feather River and Sacramento-San Joaquin Delta Diversion Projects") was authorized in 1952. However, it was not until 1959 that the Legislature enacted the Burns-Porter Act which provided for the implementation and funding of the SWP. Following voter approval of the Act in 1960, the DWR entered into contracts with 31 (now 30) public agencies (hereafter called SWP contractors). These agencies now supply water for more than two-thirds of the population of the State and to thousands of acres of irrigated land (Figure 1). The contracts call for progressive increases in the amount of annual entitlement water deliveries to the contractors, up to a maximum of 4.22 million acre-feet per year of dependable supply. The contractor's requests for entitlement water total about 2.3 million acre-feet in 1986 and 2.7 million acre-feet in 1987.

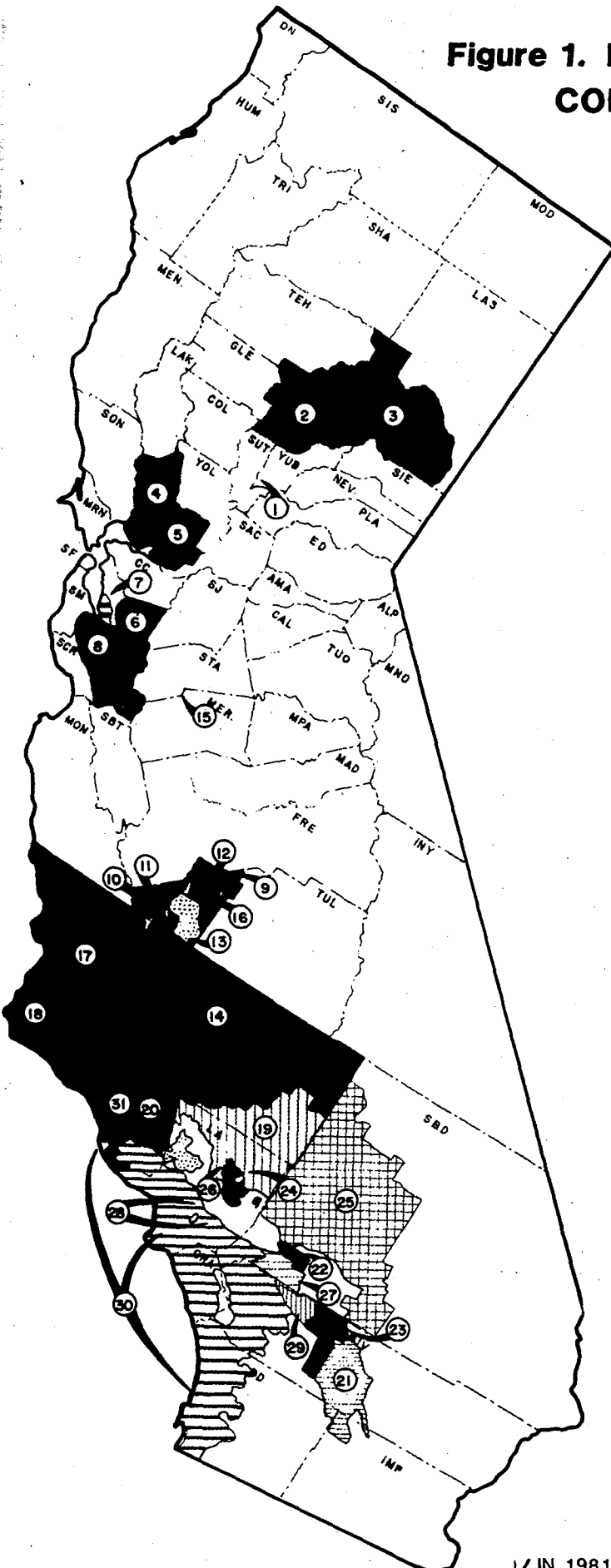
The major aqueducts and reservoirs for the SWP, as depicted in Figure 2, can provide only about 2.35 million acre-feet per year on a dependable basis (firm yield) during a recurrence of the 1928-34 critical period. Thus, the requested deliveries have reached the present dry-period *firm yield* of the SWP. During wet years, the delivery capability from existing SWP facilities is about 3.6 million acre-feet per year (*eighty-five percent* of the maximum annual entitlements).

The SWP dependable supply (over the 1928-1934 critical dry period) developed by existing conservation facilities (e.g., Oroville and San Luis Reservoirs) is expected to decrease to about 2.3 and 2.2 million acre-feet per year by 2000, as: (1) water use in areas of origin increases, (2) CVP contractual obligations increase, and (3) use of water associated with other prior rights to Northern California water supplies increases.

Contractor requests for entitlement water delivery will exceed the firm yield (2.35 million acre-feet) of existing facilities after 1986. By 1990, contractor requests are projected to total 2.9 million acre-feet per year and up to 3.3 million acre-feet per year in 2000. Annual entitlements will be 4.1 and 4.2 million acre-feet at those times. If additional water supplies are not secured, SWP contractors will face increasing risks of water supply deficiencies.

Figure 3 presents a comparison of SWP water supply capability with projected entitlement demands for 1990 and 2000 (Cal. DWR, 1985). It shows that 1990 deliveries by the indicated *existing* SWP facilities could exceed the firm yield in about 60 percent of the operational years. After 1990, however, *if no additional conservation facilities or Delta channel improvements were made*, the contractors' full entitlement requests could be met in only about 25 to 35 percent of the years. *Projects such as the Kern Water Bank are intended to prevent this loss of reliability from occurring.*

**Figure 1. LONG-TERM WATER SUPPLY
CONTRACTING AGENCIES**



Location No.	Contracting Agency	Maximum Annual Entitlement (acre-feet)
(1)		(3)
UPPER FEATHER AREA		
1	City of Yuba City	9,600
2	County of Butte	27,500
3	Plumas County Flood Control and Water Conservation District	2,700
	Subtotal	39,800
NORTH BAY AREA		
4	Napa County Flood Control and Water Conservation District	25,000
5	Solano County Flood Control and Water Conservation District	42,000
	Subtotal	67,000
SOUTH BAY AREA		
6	Alameda County Flood Control and Water Conservation Dist., Zone 7	46,000
7	Alameda County Water District	42,000
8	Santa Clara Valley Water District	100,000
	Subtotal	188,000
SAN JOAQUIN VALLEY AREA		
9	County of Kings	4,000
10	Devil's Den Water District	12,700
11	Dudley Ridge Water District	57,700
12	Empire West Side Irrigation District	3,000
13	Hacienda Water District ^{1/}	8,500
14	Kern County Water Agency	1,153,400
15	Oak Flat Water District	5,700
16	Tulare Lake Basin Water Storage District	110,000
	Subtotal	1,355,000
CENTRAL COASTAL AREA		
17	San Luis Obispo County Flood Control and Water Conservation District	25,000
18	Santa Barbara County Flood Control and Water Conservation District	45,486
	Subtotal	70,486
SOUTHERN CALIFORNIA AREA		
19	Antelope Valley-East Kern Water Agency	138,400
20	Castaic Lake Water Agency	41,500
21	Coachella Valley County Water Dist.	23,100
22	Crestline-Lake Arrowhead Water Agency	5,800
23	Desert Water Agency	38,100
24	Littlerock Creek Irrigation Dist.	2,300
25	Mojave Water Agency	50,800
26	Palmdale Water District	17,300
27	San Bernardino Valley Municipal Water District	102,600
28	San Gabriel Valley Municipal Water District	28,800
29	San Geronio Pass Water Agency	17,300
30	The Metropolitan Water District of Southern California	2,011,500
31	Ventura County Flood Control Dist.	20,000
	Subtotal	2,497,500
	Unallocated	12,214
	TOTAL STATE WATER PROJECT	4,230,000

^{1/} IN 1981 HACIENDA'S WATER CONTRACT BECAME
INTEGRATED WITH TULARE LAKE BASIN'S CONTRACT.

Figure 2. THE STATE WATER PROJECT

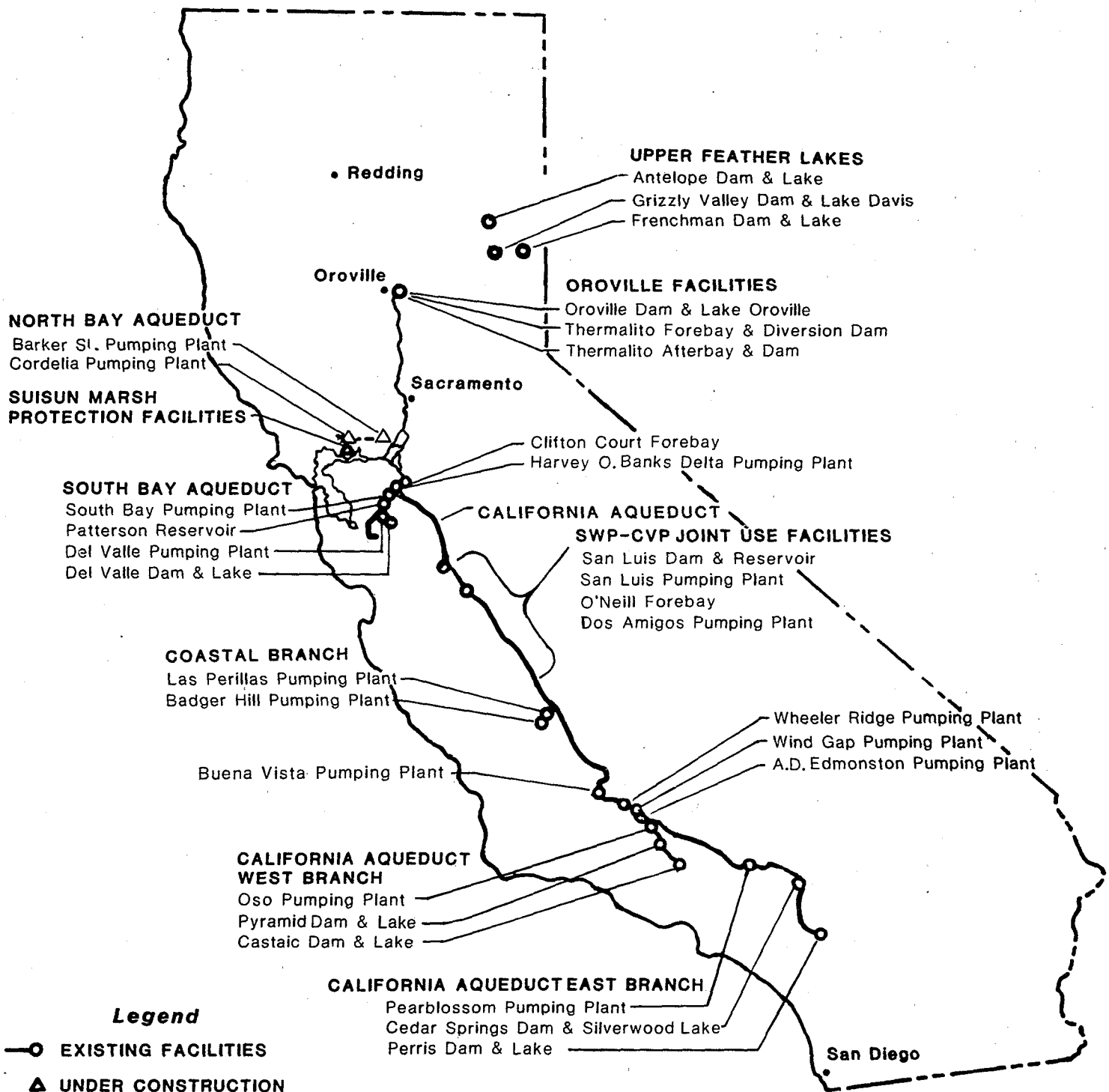
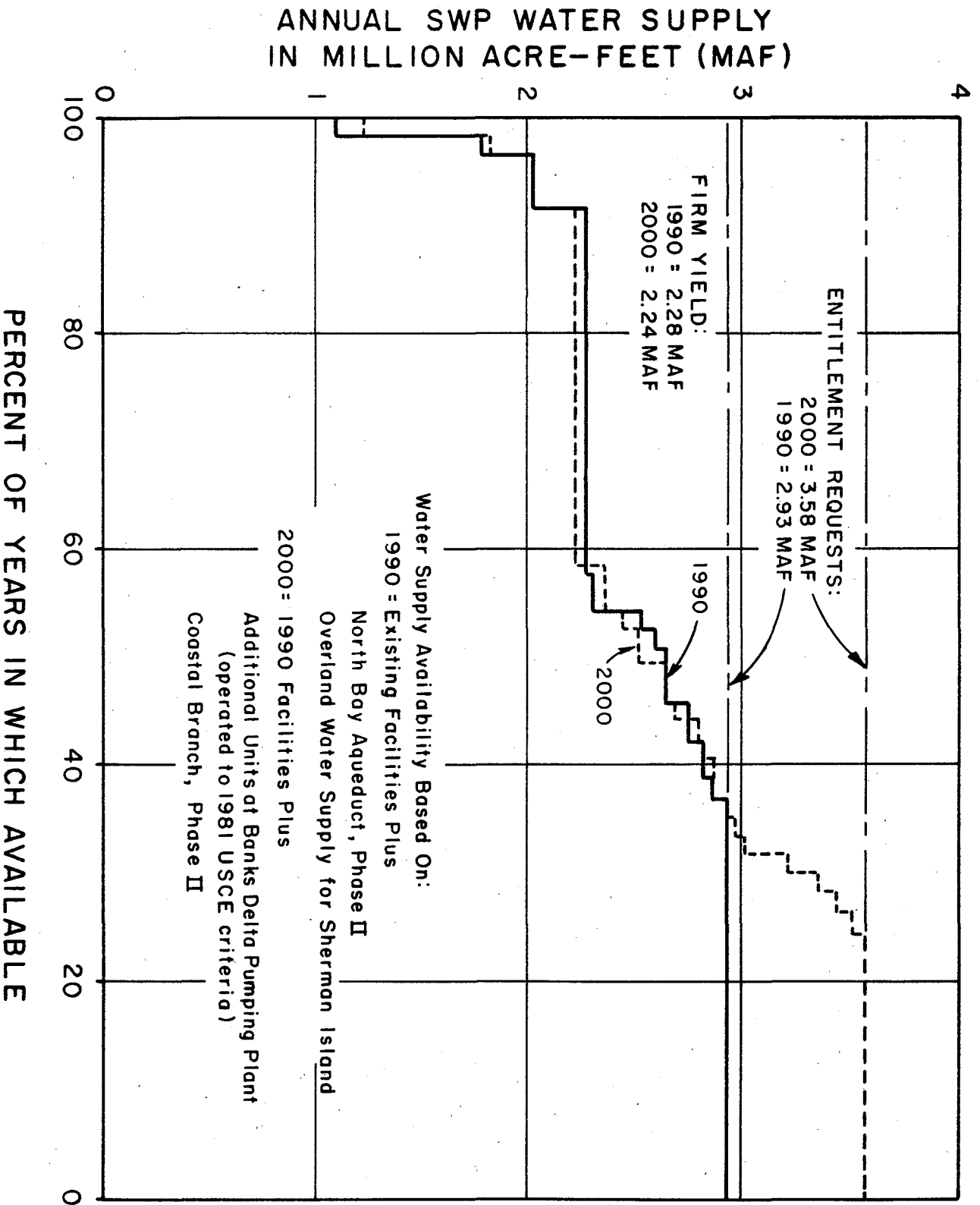


FIGURE 3. SWP WATER SUPPLY AVAILABILITY



In years of deficient SWP supply, the provisions of Article 18(a) of the SWP water supply contracts are used to determine the allocation of available water among the 30 SWP contractors. Article 18(a) contains two provisions to be applied in years of deficient SWP supply. First, the portion of the contractors' annual entitlement that is used for agricultural purposes would be reduced by as much as 50 percent in any given year or a total of 100 percent in any series of seven consecutive years. Second, if further delivery reductions are required, the deliveries to all contractors are reduced by the same percentage without regard to the uses of such water. For example, if agricultural deficiencies reach 50 percent in one year and further deficiencies are required to meet the supply, all contractors would have to take reductions in proportion to their annual entitlement.

Up until the mid-1990s, the agricultural contractors will be the larger beneficiaries of new projects (whether surface or ground water) that increase SWP water supply reliability. However, after that, the urban contractors will receive the major benefit from increased SWP reliability.

Ground Water Overdraft in the Kern County Basin

The Kern County Basin has long been subject to ground water overdraft, a condition in which more water is pumped from the basin than is recharged over an extended period. In fact, the basin has been classified as being subject to critical conditions of overdraft (Cal. DWR, 1980). The amount of overdraft has gradually diminished as imported water supplies have become available. The present long-term overdraft is about 250,000 to 300,000 acre-feet per year. Overdraft is expected to increase in the future if no additional yield facilities are constructed and as the municipal and industrial (M&I) demands on the SWP take an increasing share of the available supply to which they are entitled. The proposed project would have a two-fold favorable impact on basin overdraft. First, the increased yield available from the SWP will reduce the shortages experienced by agricultural contractors resulting from additional demands by municipal and industrial water users. Second, by taking land out of production, ground water overdraft could be reduced by up to 70,000 acre-feet per year. Credit for the overdraft reduction (*less environmental on-site uses*) will be assigned to the project. *Use of the credit will be negotiated as part of the Memorandum of Understanding and contract between DWR and KCWA.* The contributions of the project to correcting basin overdraft will help ameliorate the adverse impacts of overdraft, which include:

- Declining water levels with the associated higher pumping costs and need to deepen wells.
- Movement of poor quality water from the basin periphery into the main extraction areas.
- Land subsidence due to compaction of the aquifers.

Chapter 2. PROJECT DESCRIPTION

This section provides an overview of the project, its objectives, location, costs, project facilities, and conceptual operation of the ground water recharge, extraction, and overdraft correction program.

Project Location

The project area is located entirely in Kern County (Figures 4 and 5), southwest of the City of Bakersfield and mainly in the James-Pioneer Improvement District of North Kern WSD. A small section within the southeastern portion of the site is included in the Kern Delta WD.

The project area is located on the lower part of the Kern River Fan. The Kern River crosses the site, flowing from northeast to west. The California Aqueduct borders a portion of the western boundary along the eastern edge of the Elk Hills. South of the project site is the former Buena Vista Lakebed, now organized as the Henry Miller WD. The remaining portion of the Kern River Fan, organized respectively as the Rosedale-Rio Bravo WSD and the Kern Delta WD, borders the site to the north and east. Northwest of the project site is the Tule Elk Reserve State Park and a large portion of the Buena Vista WSD. The eastern portion of the site along the Kern River channel borders a 2,800-acre recharge site operated by the City of Bakersfield.

Project Objectives

The primary objective of the project is to *develop* additional storage and SWP yield. Up to 46,000 acres of land, currently owned by TWI would be purchased. The proposed project would be designed to increase SWP supply, to reduce overdraft in Kern County and to enhance wildlife habitat. Facilities would be constructed to transport SWP water in above normal and wet years from the California Aqueduct to basins built on the project site, where the water would percolate to ground water. *Subject to agreement with the City of Bakersfield, SWP water would also be recharged in the city's existing recharge basins.* In later below normal, dry, and critically dry years, pumps could extract ground water from the site for delivery to SWP contractors. Physically, *part of* the extracted ground water could be used *directly* within Kern County, thereby releasing surface deliveries for use in other SWP service areas. *The balance of the pumpage could also serve Kern County indirectly through exchanges of water, entitlements, and use of facilities.*

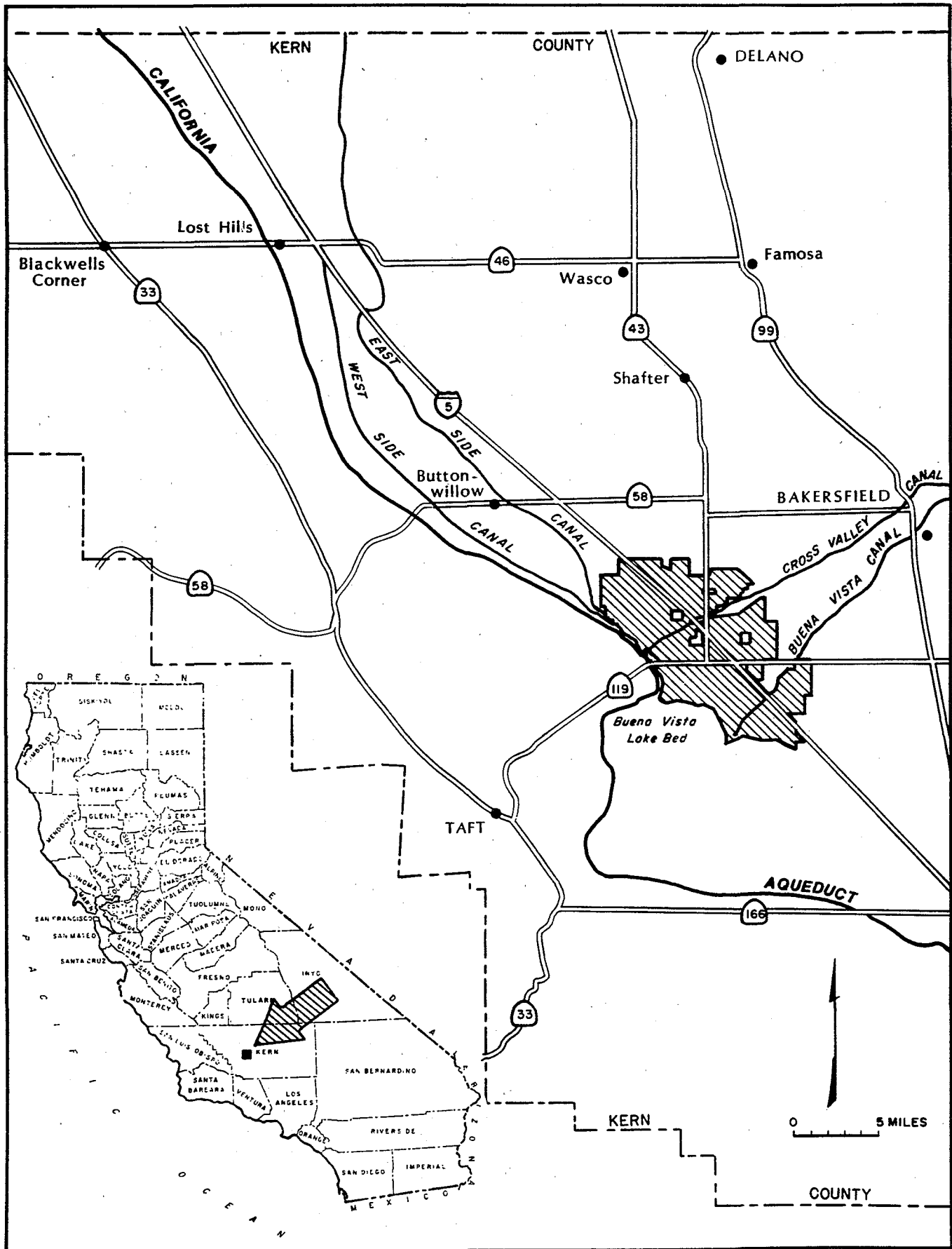
In addition to increasing SWP yield, the project would reduce overdraft by removing from production acreage that is currently using ground water for irrigation. Withdrawal of this acreage would reduce the ground water demand in the area. Purchase and removal of these lands from production would also create a buffer area between project facilities and adjacent lands and thus reduce possible impacts caused by the proposed project on local ground water users.

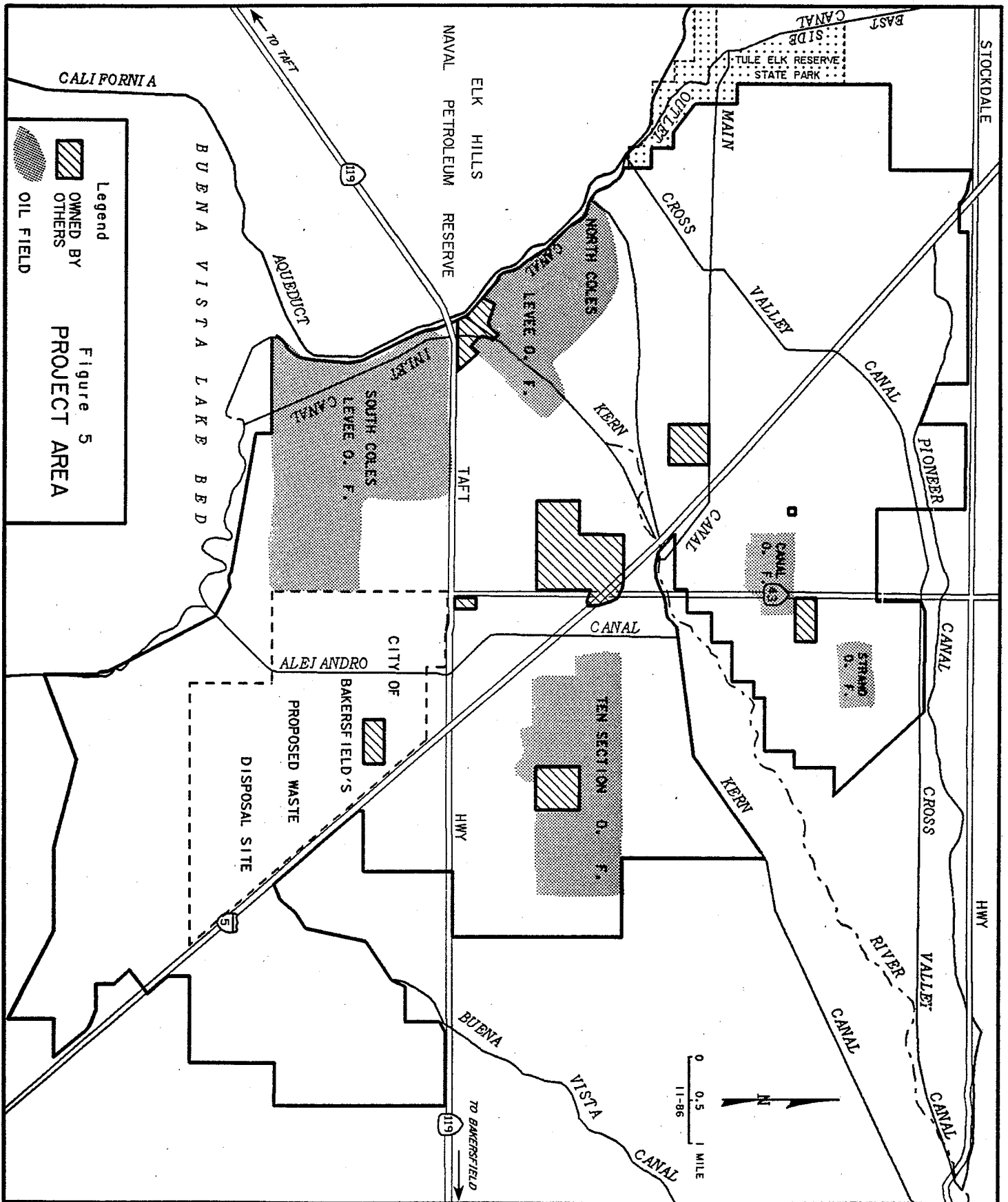
The operation of the project would result in opportunities for wildlife enhancement in the area. There would be the potential for developing intermittent wetlands for waterfowl use, as well as allowing agricultural lands outside the active recharge basins to revert to native vegetation and managing these lands to preserve sensitive species such as the blunt-nosed leopard lizard. Some of the possibilities for enhancement are discussed in a later section of this report.

Project Facilities

The ground water recharge, *extraction*, and storage portions of the project will require constructing physical facilities. These facilities have not yet been precisely located or designed. However,

Figure 4. PROJECT LOCATION





the types and approximate sizes of needed facilities are known and they are described in this section. Basically, the project will require the construction of facilities to spread water for ground water recharge, to convey water to and from the storage site, and to extract water from underground storage and deliver it to SWP contractors.

Storage of SWP water in the ground water basin will require the availability of recharge sites. Existing unlined canals in the project area may provide some limited recharge capability. However, recharge of the amounts of water contemplated for the project will require construction of new recharge basins. While these basins have not been designed, preliminary analysis of the project has focused on total recharge amounts of 30,000 to 40,000 acre-feet per month. Assuming a recharge rate of 0.5 acre-feet per acre per day in the project area, about 2,700 acres of active recharge ponds would be needed. An additional 800 acres of basins would be needed for cyclical drying of the areas, making a total requirement of about 3,500 acres of recharge basins. *Some additional land would be required for levees, access roads and other operational facilities. Ongoing studies indicate the maximum sustainable recharge rates may be about 25,000 acre-feet per month. Soils data indicate recharge rates vary from 0.33 to 0.50 acre-feet per acre per day. These factors will be considered in a separate technical report; however, their impacts are essentially the same as for the preliminary analysis. Subject to agreement with the City of Bakersfield, coordination of this project with the City of Bakersfield's recharge operation could reduce the number of new recharge basins needed and reduce the total area needed for new recharge basins to about 1,600 acres.* The number, size and distribution of individual basins will depend on site specific hydrogeology and cannot be specified at this time. However, it is anticipated that basins will be distributed over a significant portion of the property. The recharge basins will be developed into a series of smaller flow-through basins. The first basin will be used to allow settlement of suspended sediments in the recharge water. When sedimentation significantly reduces recharge rates, the basins will be reconditioned by scarifying the soil in place.

The location of the recharge basins has not been determined, but the following considerations are known that will affect siting of the basins. The basins would likely be concentrated in the northern and eastern portions of the project site where the most permeable soils are found. To minimize interference with adjacent recharge programs in Rosedale-Rio Bravo WSD's Jerry Slough, the basins would be located at some distance from these facilities. To the extent practical, the percolation basins would be located on lands currently developed for irrigated agriculture so that existing native environments would not be disturbed.

Some SWP recharge supplies may be delivered to the recharge basins through unused capacity in the Cross Valley Canal. However, the amount of available capacity in this canal is limited, and a new conveyance facility would be constructed from the California Aqueduct to the basins. The proposed canal would be approximately 10 miles long and have a capacity in the initial section of about 500 cubic feet per second (cfs). The canal would be constructed with a relatively flat slope, allowing flow in both directions. Three pumping plants would be needed to lift flows to higher elevations in the project area. Although the exact alignment of the canal has not been determined, it will be located, generally, parallel to and somewhat south of the Cross Valley Canal. *The canal would end near the upper ponds of the City's recharge area.* Branches from the canal would be constructed to specific recharge areas.

A number of water wells exist at the TWI site and some will be usable for recovering stored ground water. However, some of the existing wells lie at great distances from conveyance facilities and would not be usable for the project. The preliminary estimate of extraction rates from the project site is up to 30,000 acre-feet monthly. This rate would require installation of additional wells and pumps. For preliminary design purposes, pumping discharges of 2,000 gallons per min-

ute were assumed from newly constructed 700-foot-deep wells at the site. However, as many as half the wells may be constructed only to a depth of 350 to 400 feet. The pumps would be 150 horsepower and have plant efficiencies in excess of 60 percent over a wide range of operating lifts. A total of 110 wells and associated pumps was used for cost estimating *purposes*. The newly constructed wells would be located within the project area and adjacent to the conveyance facilities. Locations will be chosen to the extent this is consistent with efforts to limit interference with adjacent land owners ground water use.

Ground water extracted by the pumps would be collected and delivered to SWP contractors. The first stage of collection would involve small-capacity pipelines to convey the water from the pumps to various conveyance facilities in the project area.

Existing canals within the project area are potentially available for deliveries of extracted ground water to SWP contractors (Figure 5). The Cross Valley Canal, the City of Bakersfield's Kern River Canal, and Buena Vista WSD's Alejandro Canal may at times have the capacity to convey extracted ground water. The Cross Valley Canal is capable of delivering water to Cawelo WD, Improvement District No. 4, Rosedale-Rio Bravo WSD, and Arvin-Edison WSD. The Alejandro Canal could deliver water directly to Henry Miller WD and, continuing through the Outlet Canal, could supply Buena Vista WSD. The Outlet Canal passes adjacent to the California Aqueduct where construction of a pumping plant would allow deliveries directly to that canal. Finally, flow in the project's intake canal could be reversed, and that canal could be used to deliver water directly to the California Aqueduct.

Project Operation

The development of a project operation plan cannot be completed until feasibility studies defining site conditions, water supply availability and any legal and institutional constraints are completed. During the feasibility investigation, operation studies will be performed that *coordinate* the conjunctive operation of the ground water storage program with other SWP facilities and the operations of local agencies. *The operation studies will look at obtaining the maximum firm yield over the critical dry period. The operation studies described in the following sections were conducted in a manner similar to those for other SWP conservation facilities to arrive at comparable yields. Initial ground water levels and weather conditions could under actual operating conditions be different than those assumed and would have minor effects on yields. Additional studies may be required to reflect agreements with KCWA and other local agencies and by physical restrictions developed in the technical studies. The Department's decisions will be based on yields developed by the technical studies. For informational purposes, studies aimed at maximizing average annual deliveries are also described.*

Operation Studies - Year 1990

As a first step in identifying the most desirable operation, three preliminary studies of the SWP system were performed at the 1990 level of demand and development. These studies were the Base Study and two Base Plus Ground Water Studies. They were conducted to determine (a) the times and amounts of water that could be made available for storage, (b) the times when extraction from storage would be required and the amount of the extraction, and (c) the amount of increased SWP delivery that would be available through conjunctive operation.

Maximum Firm Yield

At the time the draft EIR was published, studies had not been completed on the operation modes with increases in firm yield resulting from the addition of the ground water storage program. Completed studies reflecting the Bulletin 132-86 target entitlement demand of 2,900,000 acre-feet (including

operational losses and recreation and wildlife demands) at the 1990 level of demand show that the project firm yield could be increased by as much as 162,000 acre-feet per year. If the SWP were operated to provide this level of additional firm yield it would also develop additional annual average deliveries over the historic 1922-1978 period of 69,000 acre-feet per year.

Maximum Average Annual Deliveries

The studies shown in the draft EIR were redone to match conditions for the firm yield studies. They were performed over the historic period of 1922 through 1978 and attempted to meet a target SWP entitlement demand of 2,900,000 acre-feet (including operational losses and recreation and wildlife demands) at the 1990 level of demand. Those studies concluded that if the ground water basin is operated conjunctively with the surface water facilities of the SWP, average annual SWP deliveries could be increased by as much as 225,000 acre-feet per year with no increase in firm yield. Basic assumptions are listed in following sections.

Base Study

The Base study determined the base conditions of the SWP system without a ground water storage program. The basic assumptions in this study included:

- Historic hydrology for 1922 through 1978 adjusted for expected 1990 levels of development.
- 1990 level SWP and CVP demands.
- No through-Delta facility would be available.
- Sherman Island Overland facilities would be in place but the Suisun Marsh permanent facilities would not be operational.
- The East Branch California Aqueduct would not be enlarged before 1990.
- Minimum Delta outflow requirements are those specified by the State Water Resources Control Board Decision 1485 (D-1485).
- The Harvey O. Banks Delta Pumping Plant would have an effective capacity of 6,240 cfs, except when fishery curtailments imposed by D-1485 restrict pumping to 3,000 cfs in May and June and 4,600 cfs in July.
- SWP/CVP will share water available for export from the Delta on the basis of the Coordinated Operations Agreement. Also, SWP will continue to transport CVP water to make up for D-1485 restrictions at the Tracy Pumping Plant in May and June and, until 1996, for the existing Cross Valley Canal contract.

This study defines the SWP delivery capability in the absence of an integrated ground water storage program and forms the base from which to measure the incremental water supply benefits of adding such a program.

Base Plus Ground Water Study

The second series of operation studies incorporated the assumptions of the base study and added a ground water storage project to be operated in the Kern River Fan area of Kern County. The following assumptions were used to define the operation of the ground water storage project.

- Usable ground water storage capacity of 1,000,000 acre-feet would be available. This is regulatory capacity and, therefore, is somewhat greater than present dewatered storage space un-

der the property proposed for acquisition. At the present time, there is insufficient information available to accurately determine the amount of dewatered storage space available under the property. Project operation will increase the ground water gradients toward adjacent areas and increase the amount of ground water outflow to vacant storage space in those areas.

- The maximum allowable recharge rate is 40,000 acre-feet in any month.
- The maximum allowable extraction rate is 30,000 acre-feet in any month.
- *Recharge rates anticipated for the project range from 0.5 to 0.33 acre-feet per acre per day. Evaporation rates measured in Kern County at the U. S. Bureau of Reclamation Delano Government Camp Station have averaged 1,997 millimeters, or about 6.5 feet annually between 1954 and 1979. The ratio of evaporation to recharge, therefore, ranges from about 0.036 to 0.054 with 5 percent being a rounded-off estimate. Losses on recharge are assumed to be 5 percent. Water movement out of the project site by underflow will be determined by a separate ground water simulation model and the amount that may be considered lost will be subject to negotiation with local agencies.*
- As noted in earlier sections ground water storage was operated to increase firm yield in one study. In the other study, ground water storage was operated to maximize the average annual deliveries of the SWP, while protecting the SWP yield of the base system.
- Water extracted from the ground water basin will be *generally* used to meet demands within the KCWA service area *either by direct delivery or by exchange*. The ground water deliveries to KCWA will allow surface water that otherwise would be delivered to KCWA to be delivered to other SWP contractors.
- Recharge will normally occur in wet and above normal water supply years, and extraction will occur in below normal, dry, and critical years as determined by the Four-River Index (Appendix 1). Regardless of year type, recharge will be discontinued if storage in Oroville Reservoir falls below 1,450,000 acre-feet, and extraction will begin if Oroville storage falls below 1,300,000 acre-feet. This provision is designed to protect SWP delivery capability and to minimize adverse impacts on power generation capability, fish habitat, and recreation potential.
- Local water that accumulates in storage as a result of taking land out of production was not integrated into SWP operations. This is estimated to be up to 70,000 acre-feet per year *and will not be used by the SWP, except that minor amounts may be used for onsite land management activities. Assignment of credit for reduction in local pumpage will be addressed in both a Memorandum of Understanding and a contract between DWR and KCWA.*

Subject to agreement between DWR, KCWA, and the City of Bakersfield, recharge of SWP water may be reduced during periods in which project recharge facilities are being used by other agencies to recharge excess Kern River flows. If agreed to in a contract between DWR and KCWA, local Kern River water could have first priority for spreading in wet and above normal years to minimize Kern River Intertie outflow.

Operation Studies Results

The results of these preliminary operation studies are illustrated in Figures 6A, 6B, 7A, 7B, 8A, 8B, 9A, and 9B, which summarize the recharge, extraction, storage, and delivery aspects of the conceptual operation plan for year 1990. *The figures with an "A" are for the maximum firm yield and replace Figures 6, 7, 8, and 9 in the DRAFT EIR. The figures with a "B" are for maximum annual*

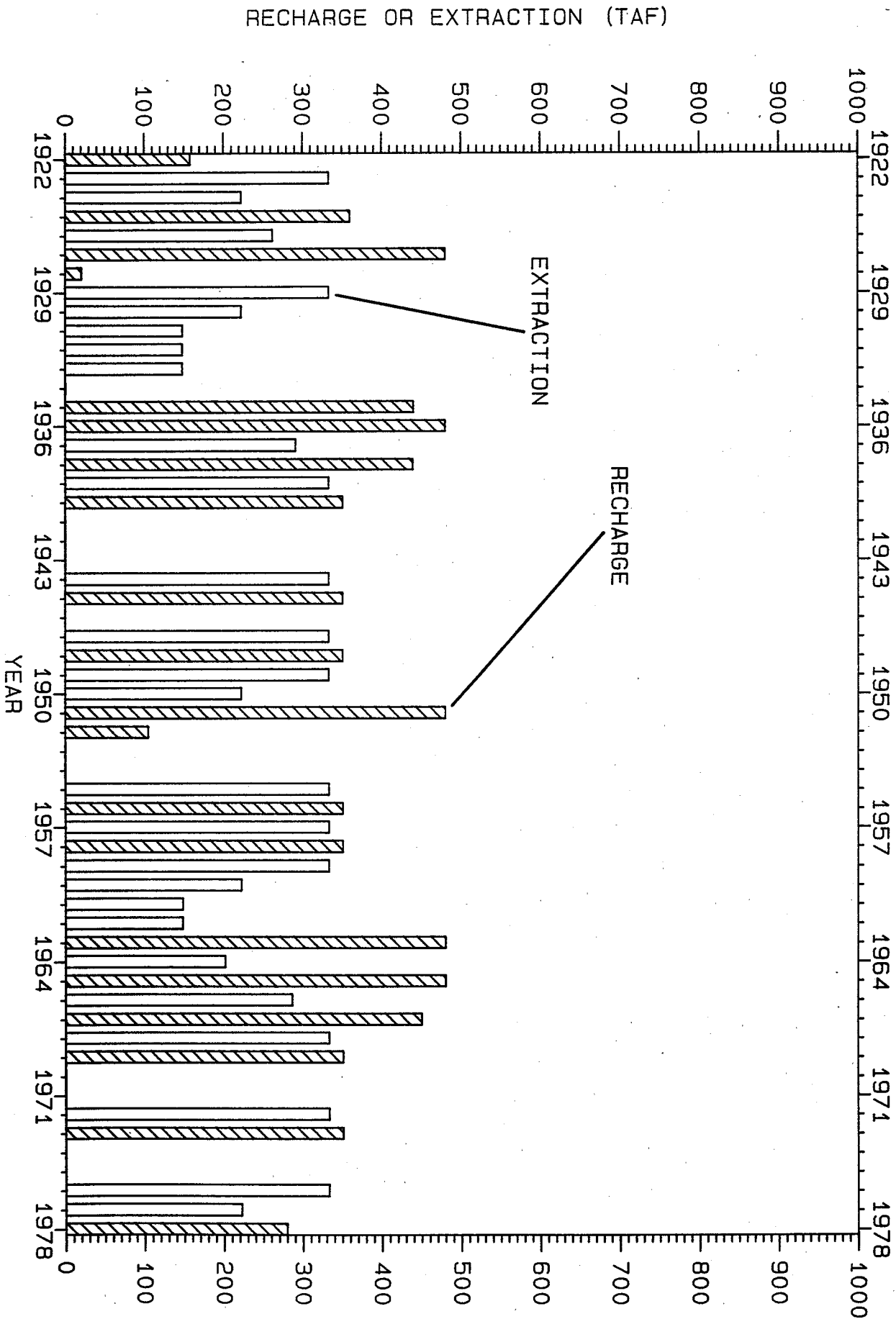


FIGURE 6A (MAXIMUM FIRM YIELD PLAN)
ANNUAL RECHARGE AND EXTRACTION (MAR-FEB)

RECHARGE OR EXTRACTION (TAF)

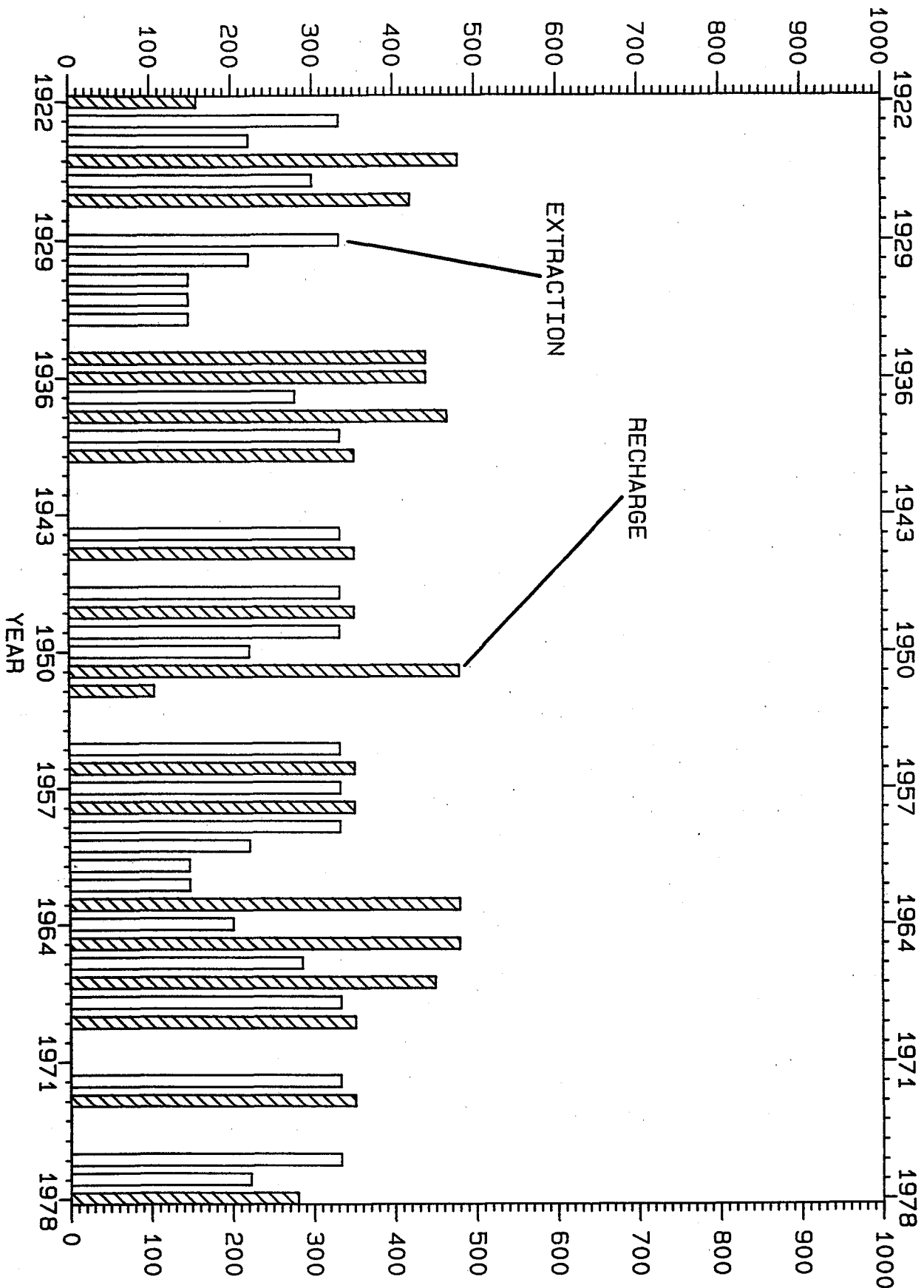
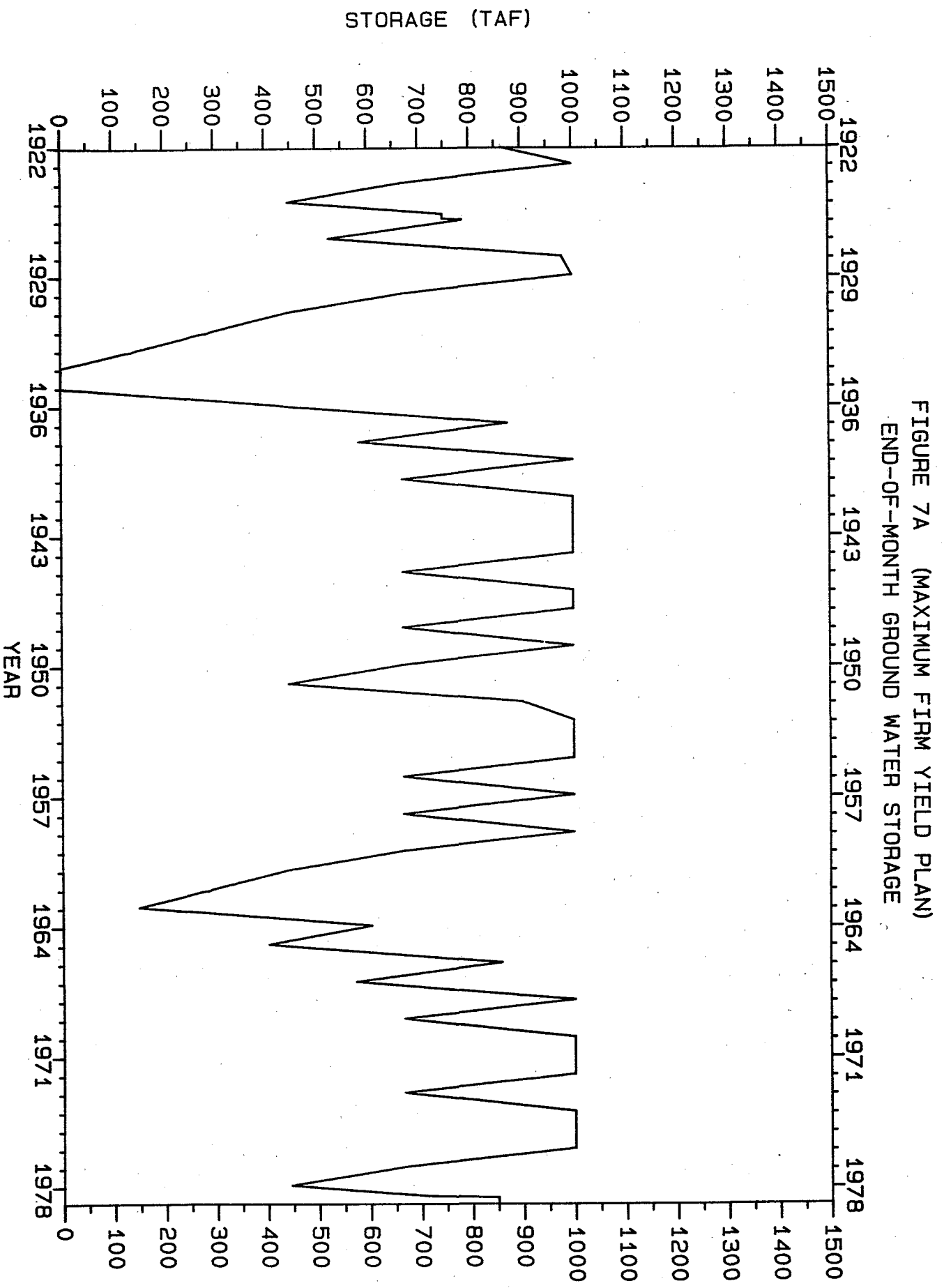
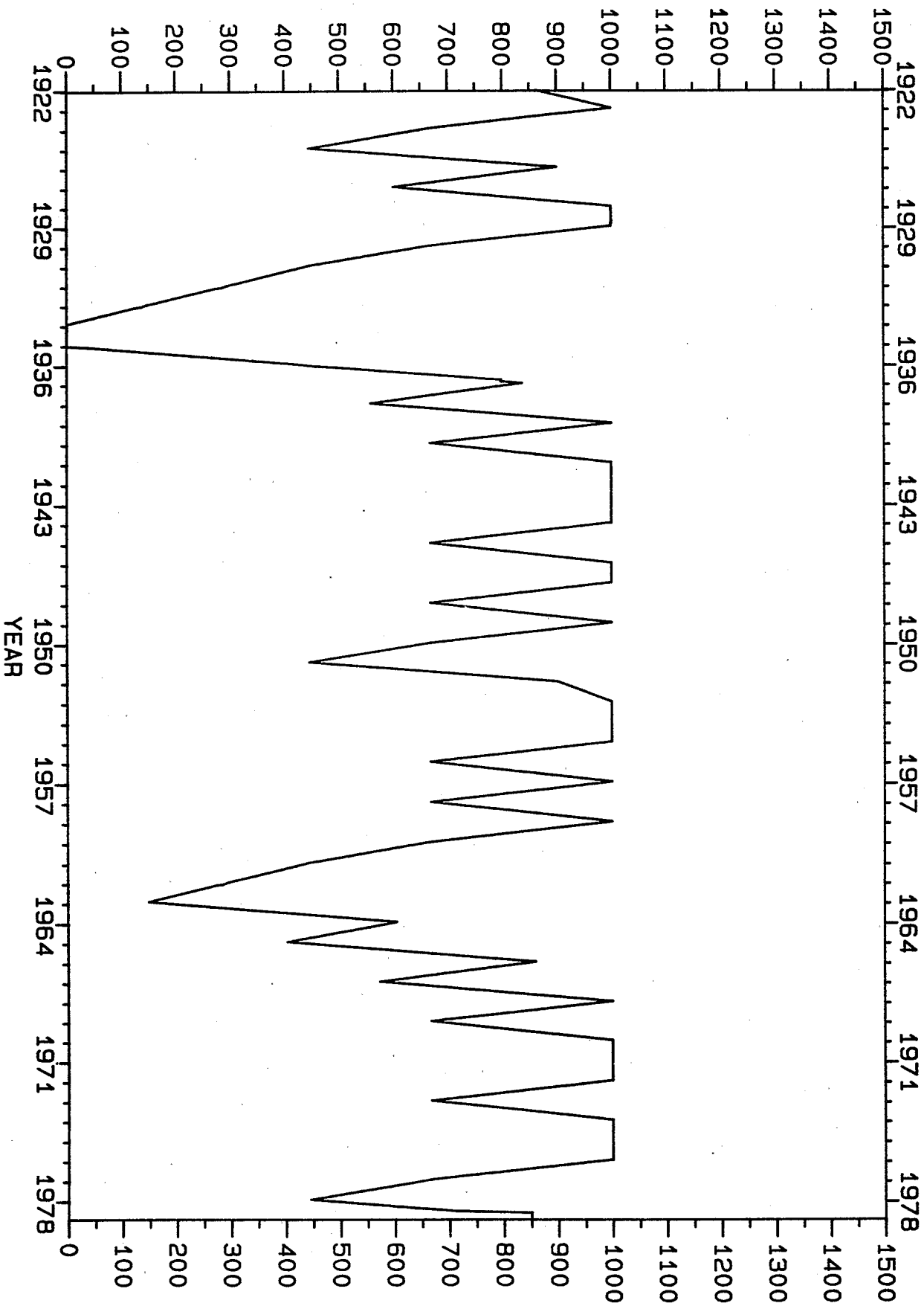


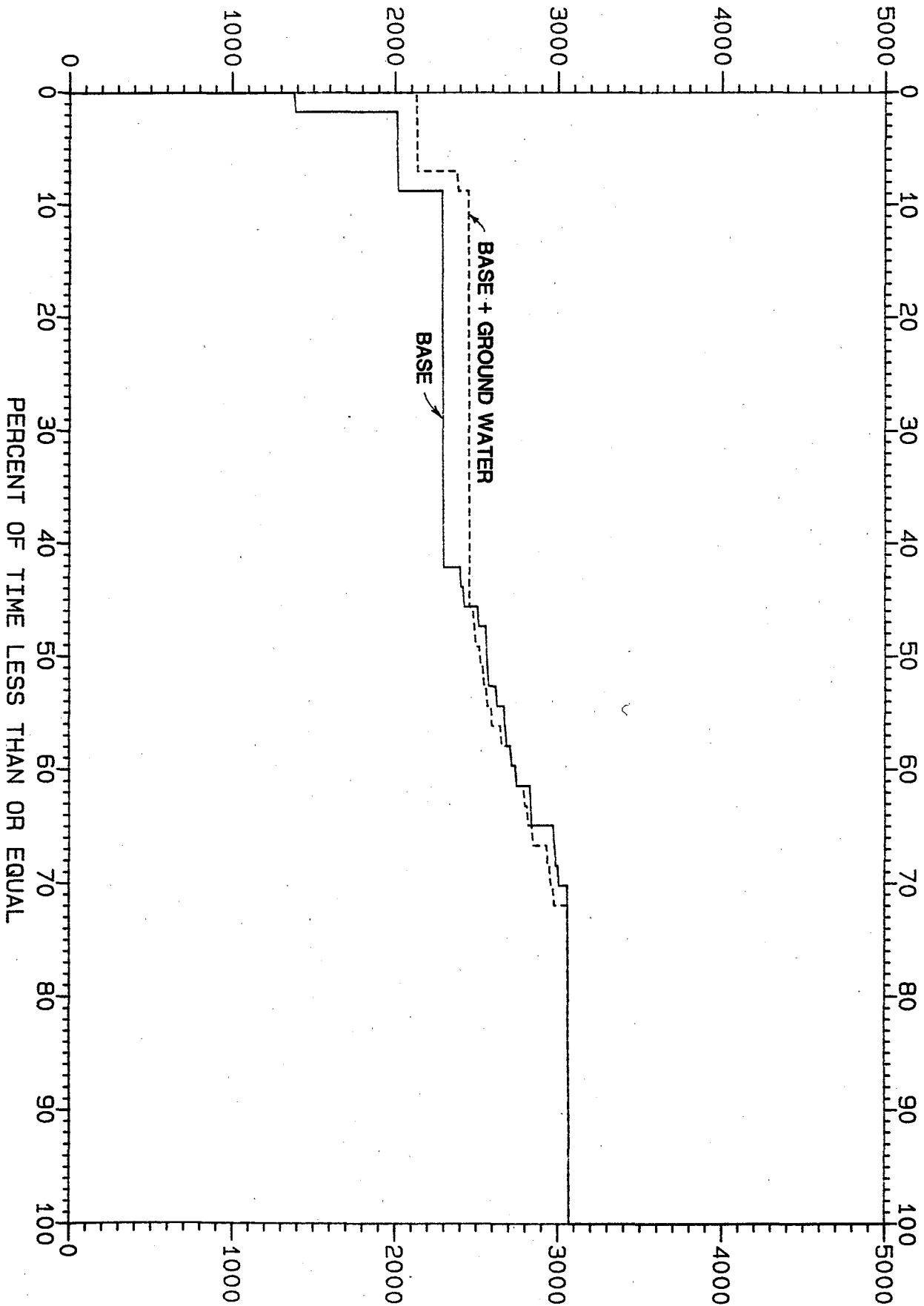
FIGURE 6B (MAXIMUM AVERAGE DELIVERY PLAN)
ANNUAL RECHARGE AND EXTRACTION (MAR-FEB)



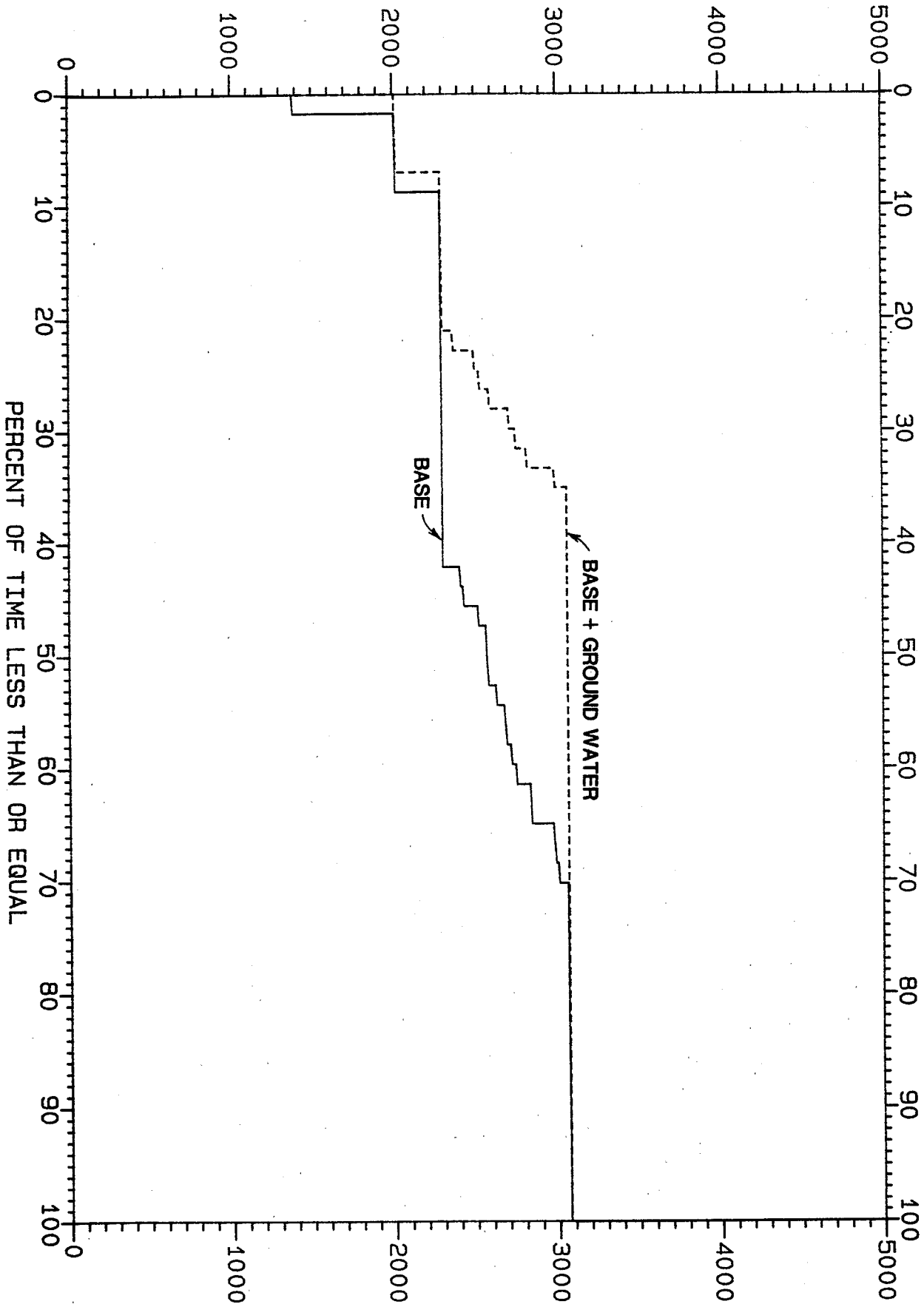
STORAGE (TAF)



DELIVERIES (TAF)



DELIVERIES (TAF)



DELIVERIES (TAF)

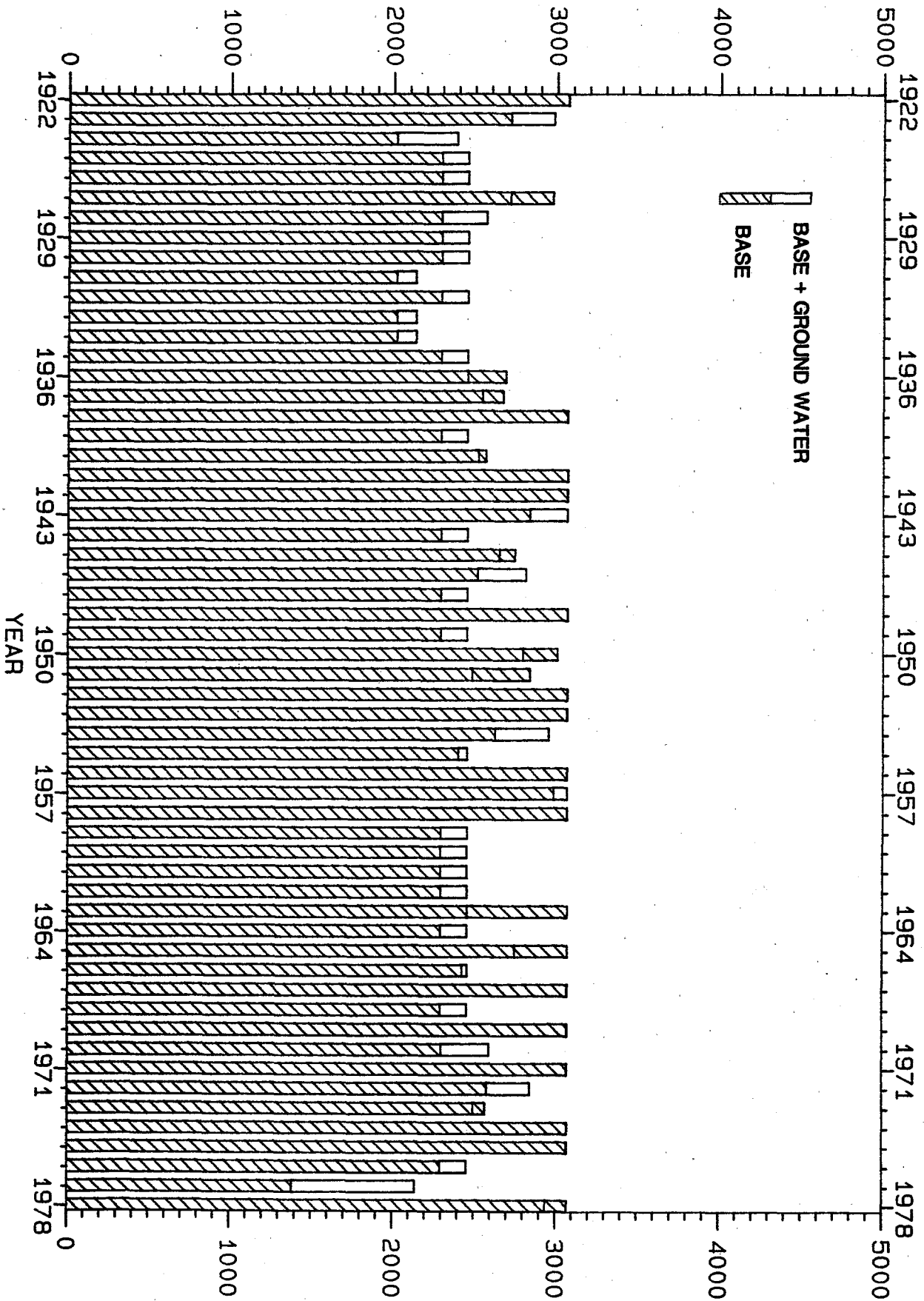


FIGURE 9A (MAXIMUM FIRM YIELD PLAN)
SMP ANNUAL DELIVERIES (MAR-FEB)

DELIVERIES (TAF)

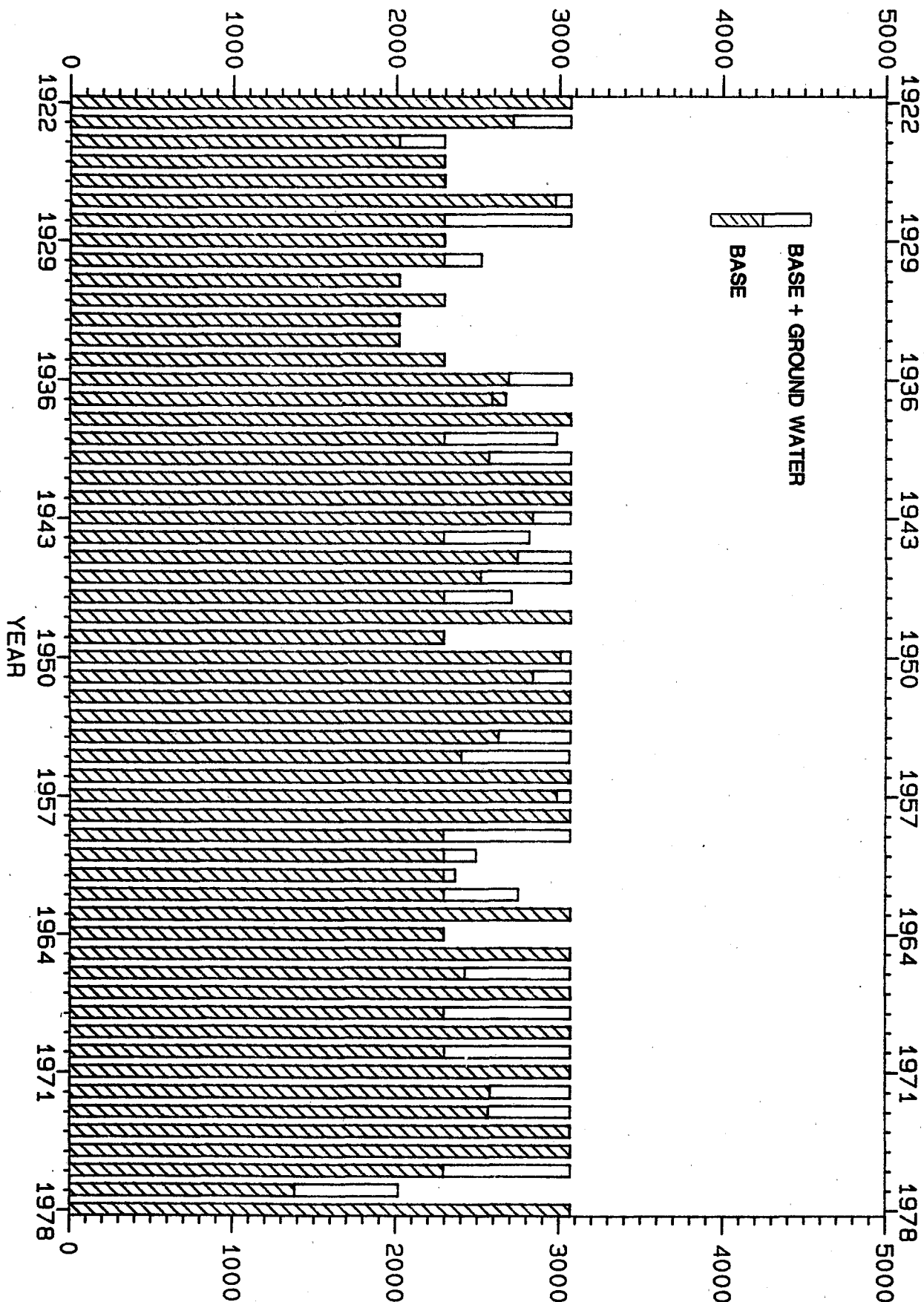


FIGURE 9B (MAXIMUM AVERAGE DELIVERY PLAN)
SWP ANNUAL DELIVERIES (MAR-FEB)

deliveries. Some small differences exist between the annual and firm studies due to program improvements, with the firm studies being done at the later time.

Recharge and Extraction. Figure 6A shows the annual amounts of water recharged to and extracted from the basin (based on the SWP operation year March through February) *under a maximum firm yield plan. Figure 6B shows the same information under a maximum annual delivery plan. Under the former plan*, recharge to the basin occurred in 20 of the 57 years over the 1922 to 1978 period. The amount of recharge varied from 20,000 to 480,000 acre-feet and averaged 125,000 acre-feet over the entire study period. Extractions from ground water storage occurred in 26 years over the operational period. Extractions varied from 150,000 acre-feet up to 330,000 acre-feet. The average annual extraction over the *entire* operational period was 120,000 acre-feet per year. The slight imbalance, resulting in average annual recharge exceeding extractions by 5,000 acre-feet per year, *is due to assumed losses.*

Figure 7A illustrates the fluctuation in ground water storage amounts that results from the recharge and withdrawal activities *under a maximum firm yield plan. Figure 7B shows the same information under a maximum annual delivery plan.* As indicated, the storage basin is assumed to be almost full, beginning in 1922, and would immediately fill. *Additional studies indicated that the basin would fill immediately if initial storage were as low as half-full. Under the firm yield plan*, the amount of water in storage fluctuates until 1929, and then it declines to zero in 1934. The historic critical dry period for the SWP extends from 1928 to 1934. During this period, the demand for SWP water far exceeds the supply, and it is over this period that minimum project yield is defined. The ground water storage depletion is quickly replaced following the end of the critical period, and storage is once again full by 1939. A long series of alternating wet and dry periods follow. Storage is often full and falls below 400,000 acre-feet in only five years. During the 1976-77 dry period, the storage capacity is heavily depleted but is refilled by SWP deliveries immediately following the drought. *Figures 8A and 8B show the changed frequency of water deliveries for the two plans; Figures 9A and 9B show the annual amounts under each plan.*

Operation of Ground Water Storage Facilities

Spreading Basins. While a specific plan of operation cannot be identified until a specific recharge project is defined (and evaluated in a supplemental report), a conceptual operation scheme can be presented here. The recharge program would be designed to maintain maximum long-term infiltration rates, estimated to be approximately *one-third to one-half foot per acre per day (assuming good maintenance practices)* of imported water. Location of spreading areas and daily operations would be managed to maximize the subsurface movement of water away from the spreading basin while preventing the development of a ground water mound that could reach the bottom of the recharge ponds, thereby reducing infiltration rates. The project would also be operated in coordination with the recharge facilities of other agencies to ensure that the recharge of locally available water could continue with minimum interference. Careful monitoring of the recharge facilities and ground water levels throughout the project area would occur.

The spreading areas would be located so as to distribute recharged water over a significant portion of the project site and to minimize local water level rises near the facilities. Each recharge area could be subdivided into a series of ponds that could be operated on a flow-through basis to minimize sedimentation, with flow restricted by gated control structures. *Up to one-third* of the spreading area would remain out of service for reconditioning at any time. If infiltration rates decline due to sediment accumulation, biological activity, or chemical interaction of the recharge water with soil materials, ponds would be dried and reconditioned. Recharge activity would shift to previously reconditioned ponds. Reconditioning intervals would depend on the actual operational experiences of the project.

Extraction Facilities. Extraction would be accomplished by as many as 110 high-capacity wells. Pumping from these wells would occur when the SWP experiences shortages in surface water delivery capability. It has been assumed that up to a maximum of 360,000 acre-feet may be recaptured in any given year, although little or no water would be extracted in many years. Well fields would be located, designed, and operated to minimize interference between wells on the site and to reduce water level declines outside the project area to reasonable levels, while allowing the efficient recapture of stored water. This may require wells to be widely distributed within the project area.

The water pumped from storage would be delivered primarily to KCWA for use in Kern County. In years of extreme water shortage, it may be desirable to export a small amount of water if extraction amounts would exceed KCWA's entitlement deliveries. It is anticipated that a portion of the pumped water would be placed in the Cross Valley Canal for delivery and that some may be delivered through the existing Alejandro Canal. During years with high extraction rates, water would be placed in the project intake canal and pumped back into the California Aqueduct for delivery elsewhere in Kern County. Some water could be delivered indirectly to adjacent water agencies by ground water outflow from the project area. This water could be pumped by individuals within those agencies. Water could also be delivered to other SWP contractors by exchange for surface water deliveries that otherwise would have gone to KCWA. It might be desirable to pump some water in advance of recharge to provide storage space. The project would be operated to replace this water with no net withdrawal from the basin over the operational period. Another alternative might be to purchase water that had been stored previously by local entities.

Potential Local Use of Project Facilities

There is potential for local management and use of project facilities to improve the efficiency of local recharge operations and to capture local water supplies (Kern River and floodflows imported through the Friant-Kern Canal) that would otherwise be lost to the County through the Kern River Intertie or by flow to Tulare Lake. *Following a Memorandum of Understanding or contract with the City of Bakersfield*, close coordination would be maintained *with the City of Bakersfield and Kern River interests* to assure that infiltration and storage capacity would be available for local recharge activities. It is desirable to construct a connection between the Kern River and the percolation ponds to allow local agencies to make use of available project infiltration capacity, thereby increasing their capability of capturing local water.

Project Cost

Costs *presented in the draft Program EIR* were estimated for the conceptual ground water recharge program on the proposed project site. First-cost estimates, that is capital costs to construct facilities, were based on construction of generic features that are not site-specific. The locations of the canal, wells, and related facilities were not determined. The first cost consisted of:

- Purchase price for up to 46,000 acres of land.
- Construction of a ten-mile canal (assumed to be lined for cost estimating) and one pumping plant with a capacity of 700 cfs.
- Construction of up to 3,500 acres of spreading basins.
- Construction of 110 new wells. The number of existing wells that may be usable has not been determined. If existing wells can be used, the number of new wells can be reduced.

- Construction of surface collection facilities to transport water from wells to an existing local canal or back to the California Aqueduct.

The estimated cost of the above items is about \$100 million. If this cost were financed by revenue bonds over 30 years at 9 percent interest, the annual debt service would be about \$10 million.

An estimate for the annual operation cost was based on an average annual recharge of 100,000 acre-feet per year and an average annual extraction of 100,000 acre-feet per year. However, extraction and recharge costs are not likely to occur in the same year. Annual cost estimates include maintenance costs for the canal, wells, and spreading grounds; recharge costs which consist of pumping costs in the new canal and variable spreading costs in the spreading grounds; and extraction costs for pumping from the basin to the surface distribution facilities. The estimated average annual operation costs are about \$3 million per year.

The total annual costs for debt service and operation would be about \$13 million. Considering only the average annual extraction of 100,000 acre-feet per year from the basin, the new water would cost about \$130 per acre-foot. If the ground water basin is operated conjunctively with the SWP surface water facilities *in a manner to develop maximum average deliveries of 224,000 acre-feet per year, the unit cost would be \$60 per acre-foot.*

Current studies will result in unit costs for a maximum safe yield operation. The current studies indicate that first costs will consist of:

- *Purchase price of less than 46,000 acres.*
- *Construction of a 10-mile lined canal and three pumping plants of capacities ranging from 200 to 500 cfs.*
- *Construction of 1600 acres of spreading grounds.*
- *Construction of about 60 new wells and conversion of 50 existing wells.*
- *Construction of roads and other operation facilities.*
- *Construction of surface facilities to connect new canal to spreading basins and wells to conveyance facilities.*
- *An allowance for mitigation.*

Yields and unit costs based on the prefeasibility study will be included in the technical report. Both the yields and costs will fall within the range reported in the draft Program EIR.

Chapter 3. GENERAL ENVIRONMENTAL SETTING

Climate

The project area is characterized by a Mediterranean type climate with hot, dry summers and mild, damp winters. Climatic data for selected locations near the project area are shown in Table 1. Average monthly temperatures in Bakersfield range from 48°F in January to 84°F in July, with extremes ranging from 20°F to about 110°F. The percentage of sunshine throughout the year is high with nearly cloudless summers. Dense radiation fog occurs in the area during the winter. The average length of the growing season is about 300 days.

Precipitation in the project area is influenced by topography. Moist air moving in from the Pacific Ocean flows over the Coast Range. As this air flows down into the San Joaquin Valley, a "rain shadow" is formed east of the Coast Range. Average annual rainfall in the area is about 6 inches, and most of the precipitation occurs from November to April.

The prevailing wind direction in the project area is from the northwest. However, from November through March the wind direction is likely to shift due to storm patterns. Wind speed on the Valley floor averages about 6 miles per hour, with extremes occasionally reaching 60 to 80 miles per hour.

Topography

The project site is located in the San Joaquin Valley trough. This trough, bounded by the Sierra Nevada to the east, the Tehachapi Mountains to the south, and the Coast Range to the west, follows a northwest to southeast course and forms the valley floor.

The project location is a gently sloping land surface with a maximum relief of about 60 feet. Land surface elevations over the project site range from 290 feet above sea level on the west side to 350 feet above sea level on the east side. The slope across the property (measured generally along the Kern River) is about 9 feet per mile. Most of the land has been tilled for agriculture, and the land surface exhibits little variation. A few exceptions to this pattern exist where levees have been modified or constructed to channel flood waters away from agricultural lands and oil drilling activities.

Soils

Soils within the project boundaries range from highly permeable, coarse sandy soils to silty loam with very low permeability. Generally, most of the 46,000 acres can be characterized as having deep, well-drained sandy loam soils. These soils usually have moderate to rapid permeabilities with low water-holding capacity. A few pockets of clay loam soils also can be found. These soils have low permeabilities and are often associated with saline-alkali conditions.

Cajon sandy loam soils are the predominant type found north of the Kern River (within the project boundaries). These soils have a low available water capacity. Kimberlina fine sandy loam soils also found in this area have characteristics similar to the Cajon soils but have slightly lower permeabilities. The dominant soil south of the Kern River is the Excelsior sandy loam. This deep, well-drained soil has moderate permeability and moderate available water capacity.

North and south of State Highway 119 (Taft Highway), the saline-alkali, Kimberlina fine sandy loam is predominant. This soil is characterized by a moderately low permeability and a low available

TABLE 1. CLIMATIC DATA
Average Monthly Temperature, Precipitation
and Pan Evaporation for Selected Locations

	Temperature (°F)												
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Annual
Bakersfield													
Max.	57.4	63.7	68.6	75.1	83.9	92.2	98.8	96.4	90.8	81.0	67.4	57.6	77.7
Min.	38.9	42.6	45.5	50.1	57.2	64.3	70.1	68.5	63.8	54.9	44.9	38.7	53.3
Mean	48.2	53.2	57.1	62.7	70.6	78.3	84.5	82.4	77.3	68.0	56.2	48.2	65.6
Buttontwillow													
Max.	55.9	62.7	68.3	75.3	83.9	92.3	98.6	96.7	91.5	81.6	67.4	56.6	77.6
Min.	33.9	38.0	41.7	46.4	53.3	59.8	65.1	63.0	57.4	48.2	38.5	33.2	48.2
Mean	44.9	50.4	55.0	60.9	68.6	76.1	81.9	79.9	74.5	64.9	53.0	45.0	62.9
Masoco													
Max.	55.6	62.8	68.7	75.6	84.5	92.9	99.1	97.0	91.5	81.5	67.1	56.2	77.7
Min.	35.4	39.4	42.9	47.8	54.1	60.6	65.8	63.8	58.8	49.7	40.6	35.2	49.5
Mean	45.6	51.1	55.8	61.7	69.4	76.8	82.5	80.4	75.2	65.6	53.9	45.7	63.6
Precipitation (inches)													
Bakersfield	.98	1.07	.87	.70	.24	.07	.01	.05	.13	.30	.65	.65	5.72
Buttontwillow	.97	1.05	.75	.58	.21	.04	.03	.01	.17	.24	.55	.58	5.18
Masoco	1.20	1.28	1.01	.76	.26	.06	.02	.01	.15	.25	.68	.80	6.48
Pan Evaporation (inches)													
Bakersfield*	2.1	1.8	3.7	5.6	7.9	8.2	8.9	8.2	6.4	3.7	3.4	1.3	62.6
Buttontwillow*	2.0	2.4	4.6	7.4	9.5	9.9	9.9	7.8	6.1	4.7	1.8	0.9	66.9
Masoco**	3.6	2.6	5.1	7.5	11.2	12.2	12.4	10.6	8.2	5.4	2.4	1.3	80.3
Taft	2.1	2.9	5.5	7.8	11.5	13.8	15.5	13.9	10.4	6.8	3.3	1.8	95.0

* Limited data available; 1 year record
** U. S. Cotton Field Station near Masoco

Source:

National Oceanic and Atmospheric Administration. Monthly Normals of Temperature, Precipitation, and Heating and Cooling Degree Days 1951-1980, California. Climatology of the United States, No. 81. September 1982.

California Department of Water Resources. Evaporation from Water Surfaces in California, Bulletin 73-79. November 1979.

water capacity. Isolated pockets of poorly drained Panoche clay loam with low permeability can be found in this area as well.

The northwest area is dominated by Kimberlina fine sandy loam. Soils with low permeability such as Lerdo complex and Garces silt loam are found throughout the area. South of the Kern River bypass channel, Kimberlina fine sandy loam and saline-alkali soils are dominant. Farther south, the saline alkali soils predominate with the Hesperia-Hanford, Traver-Pond, and Merced Rossi soils. These soil series are all derived from granitic rocks and have poor to moderate permeability characteristics.

Air Quality

The project site lies within the boundaries of the San Joaquin Valley Air Basin, as designated by the California Air Resources Board (CARB). CARB operates several monitoring stations in Kern County, including one installation each at Taft, the Kern National Wildlife Refuge, and Oildale, and three in Bakersfield. The Chester Street monitoring station in Bakersfield measures all the critical parameters, including ozone, carbon monoxide, nitrogen dioxide, nitric oxide, oxides of nitrogen, particulate matter, and lead. The other monitoring stations in Kern County measure only one or a few of these constituents. Air quality data for the constituents listed above, as well as the State and Federal standards, are shown in Table 2.

The Bakersfield area is characterized by CARB as a nonattainment zone for carbon monoxide. This means that the carbon monoxide levels occasionally exceed the federal standard of 35 parts per million for a one-hour period. Kern County in general is also a nonattainment zone for ozone and total suspended particulates.

Generally, the air quality is influenced by wind direction and velocity, geography, vegetation, and climate of the region, as well as the amount of natural and artificial pollutants introduced into the air basin. The light winds and atmospheric stability of the lower San Joaquin Valley provide ideal conditions for the development of air pollution. The accumulation of harmful levels of pollutants occur frequently over the valley floor.

Hydrology

Surface Water

Three sources of surface water have historically been used in Kern County-- Kern River, Friant-Kern Canal, and SWP. A brief description of each of these supply sources and their water quality follows.

Kern River. To date, the Kern River has been the only source of surface water to the project site and, historically, it has been the primary source of surface water to Kern County as a whole. The river drains a 2,420-square mile area of the southern Sierra Nevada. From the head of its drainage area, the river's main stem flows south to its confluence with the South Fork at Isabella Reservoir. Downstream of Isabella Reservoir, the river flows generally southwest, entering the valley northeast of Bakersfield. Flows near Bakersfield (First Point of Measurement) averaged 731,000 acre-feet annually between 1896 and 1985. In most years, all Kern River flow is diverted just downstream from its entrance to the valley floor and the river channel through the project site is dry. In extremely wet years, surplus Kern River flows have been diverted into the California Aqueduct by way of the Kern River Intertie to prevent downstream flooding.

TABLE 2
SELECTED AIR QUALITY CONTAMINANTS
AND AMBIENT AIR QUALITY STANDARDS

Average	Ozone (ppm)	Carbon Monoxide (ppm)	Nitric Oxide (ppm)	Nitrogen Dioxide (ppm)	Oxides of Nitrogen (ppm)	Partic- ulate Matter ($\mu\text{g}/\text{m}^3$)	Lead ($\mu\text{g}/\text{m}^3$)
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**Selected Contaminants at Bakersfield
Chester Avenue Air Monitoring Station**

February 1985

Maximum hourly average	0.08	7	0.42	0.09	0.48	120 ¹	0.48 ¹
Average of maxi- mum hourly aver- age	0.05	4	0.22	0.06	0.27	86 ²	0.41 ²

June 1985

Maximum hourly average	0.12	6	0.27	0.09	0.33	74 ¹	0.22 ¹
Average of maxi- mum hourly aver- age	0.09	2	0.09	0.07	0.14	62 ³	0.19 ³

Ambient Standards (One-Hour Average)

California	0.10	20	4	0.25	4	100 ⁵	1.5 ⁶
Federal (primary)	0.12	35	4	7	4	260 ⁵	1.5 ⁸

¹Maximum 24-hour sample collected during month.

²Average of four 24-hour samples.

³Average of five 24-hour samples.

⁴No standard set.

⁵For 24-hour period.

⁶30-day mean.

⁷No standard set for one-hour average.

⁸Quarterly mean.

Surface water rights to the Kern River were first adjudicated with the 1888 Miller-Haggin Agreement. Subsequent court rulings and amendments by water rights holders have resulted in the current "law of the river" which governs allocations of river water. These agreements allocate the majority of Kern River water to North Kern WSD, Kern Delta WD, Buena Vista WSD, and the City of Bakersfield. Other Kern River diverters have only small diversion rights or are able to divert only water they have purchased from primary water rights holders.

Most of the *project area* is located in the James-Pioneer ID of North Kern WSD and have no firm right to divert Kern River water. James Pioneer ID diversions for the water years (October 1 through September 30) 1969- 70 through 1983-84 are shown in Table 3. These diversions were taken over a period when the flow in the Kern River was considerably above normal. The conditions in 1975 approximate long-term normal flows and diversions. These diversions consist of purchased water or surplus river flows available in extremely wet years. In addition to the James-Pioneer ID diversions, a small portion of the *project site* lies in the Buena Vista and Stine Canal service areas of Kern Delta WD. The total Buena Vista and Stine Canal diversions are also shown in Table 3.

The quality of Kern River water as it enters the San Joaquin Valley is excellent, making the water suitable for both domestic and irrigation uses. A summary of analyses of numerous samples collected in recent years is shown in Table 4.

Friant-Kern Canal. Historically, no Friant-Kern imports have been used in the *project site*, but they have supplied adjacent agencies and contributed flow to the Kern River. The Friant-Kern Canal diverts San Joaquin River flows at Friant Dam northeast of Fresno. The canal flows south from there, supplying surface water to several agencies in Fresno, Kings, Tulare, and Kern Counties. The Friant-Kern Canal terminates at the Kern River near Bakersfield. In extremely wet years, flows from the Kaweah and Tule Rivers also are diverted into the Friant-Kern Canal and eventually into the Kern River to alleviate flooding in the Tulare lakebed.

The quality of Friant-Kern Canal water is excellent--well within the limits for both domestic and irrigation uses. A summary of analyses of the chemical quality of Friant-Kern Canal water at Friant is shown in Table 4.

State Water Project. Historically, the *project site* has not used surface water from the SWP. However, the SWP does constitute a large source of supply for Kern County lands adjacent to the site. The California Aqueduct would be the primary source of recharge water for the proposed ground water storage program. The Harvey O. Banks Delta Pumping Plant (an SWP facility) diverts releases from Oroville Dam on the Feather River and surplus flows in the Sacramento-San Joaquin Delta. South of the Delta Pumping Plant, the California Aqueduct flows along the west side of the San Joaquin Valley to Kern County and ultimately to Southern California.

The quality of SWP water is not as high as the Kern River or Friant-Kern Canal supplies, but it is suitable for domestic and irrigation uses. A summary of water quality in the California Aqueduct, as recorded near Kettleman City, is shown in Column 3 of Table 4. Besides the water quality parameters summarized in Table 4, DWR has monitored the California Aqueduct for selenium and other minor elements. In 1985, selenium concentrations in the Aqueduct were less than .001 mg/l, a negligible level.

TABLE 3
KERN RIVER DIVERSIONS TO PROJECT SITE

Water Year	James Canal	Pioneer Canal	Total JPID	Buena Vista Canal*	Stine Canal**
1970	19,819	19,649	39,468	15,774	7,166
1971	10,652	2,841	13,493	9,467	4,380
1972	5,541	363	5,904	13,954	3,025
1973	7,021	13,352	20,553	21,204	14,372
1974	7,871	0	7,871	19,826	13,663
1975	8,614	0	8,614	16,156	7,449
1976	8,519	0	8,519	9,324	2,835
1977	842	0	842	2,614	123
1978	7,273	35,837	43,110	28,847	15,769
1979	22,660	19,094	41,754	25,484	21,631
1980	19,999	36,515	56,514	30,697	29,319
1981	643	1,133	1,776	20,986	23,373
1982	13,509	25,833	39,342	28,368	30,524
1983	23,233	76,103	99,336	42,365	33,554
1984	4,841	24,750	29,591	30,782	36,406
AVERAGE	10,736	17,043	27,779	20,790	16,239

*Project site includes approximately 25 percent of Buena Vista Canal Service Area.

**Project site includes approximately 10 percent of Stine Canal Service Area.

TABLE 4
SURFACE WATER QUALITY OF KERN COUNTY SUPPLIES

Constituent	Kern River ¹ (1951-1985)				Friant-Kern Canal ² (1974-1981)				State Water Projects ³ (1980-1984)			
	Concentration (mg/l)				Concentration (mg/l)				Concentration (mg/l)			
	No. of Analyses	Min.	Max.	Avg.	No. of Analyses	Min.	Max.	Avg.	No. of Analyses	Min.	Max.	Avg.
Calcium	132	6.0	64.0	14.1	47	0.6	5.5	2.9	—	—	—	—
Magnesium	132	0.4	29.0	2.8	47	0.1	1.3	0.5	—	—	—	—
Sodium	236	1.5	190.0	15.2	47	1.1	5.2	2.8	*	17	91	38
Potassium	101	0.0	23.0	2.0	47	0.2	1.2	0.7	—	—	—	—
Carbonate	—	—	—	—	13	11.0	29.0	18.0	—	—	—	—
Sulfate	81	0.0	44.0	10.6	43	0.3	6.0	1.7	*	11	98	37
Chloride	244	0.0	22.0	6.9	47	0.6	4.0	1.9	*	26	101	44
Nitrate	51	0.0	3.0	0.7	58	0.0	6.2	1.7	—	—	—	—
Fluoride	27	0.00	0.50	0.26	37	0.00	0.20	0.09	—	—	—	—
Boron	221	0.00	0.46	0.14	5	0.00	0.00	0.00	*	0.1	0.9	0.2
Total Hardness	249	19	168	47	47	2	17	10	*	48	174	87
Total Dissolved												
Solids	61	46	187	87	43	13	43	25	*	112	478	218
Spec. Cond.	248	57	400	161	65	19	63	34	*	191	803	371
pH (Units)	204	6.6	8.9	7.6	65	5.5	7.6	7.2	*	7.4	8.6	8.0

¹Source: Dept. of Water Resources data on EPA STORET System.

²Source: U. S. Geological Survey data on EPA STORET System.

³Source: DWR O&M Monthly SWP Operations Report.

* Monthly Summaries based on instantaneous EC recordings.

Ground Water Conditions and Quality

The project area overlies a portion of the Kern County Ground Water Basin (Cal. DWR, 1980) which is defined by DWR as the portion of San Joaquin Valley alluvial material lying in Kern County. The eastern, southern, and western boundaries of this basin lie at the edge of the consolidated rocks of the Sierra Nevada, the San Emigdio Mountains, and Coast Ranges. Flow into or from the basin across these boundaries is negligible due to the extremely low permeabilities of the consolidated boundary material. The northern boundary of the basin crosses the valley alluvium at the northern Kern County line. Ground water flow across this boundary, while occurring in small quantities, is inhibited by the presence of relatively impermeable lakebed deposits underlying Tulare Lake and by *generally equal* ground water levels along both sides of the boundary.

The San Joaquin Valley is a large structural depression that has filled with the erosional debris of neighboring mountain ranges. Historic changes in hydrology and the rate of erosion of the neighboring mountains have resulted in a heterogeneous mixture of gravel, sand, silt, and clay. The exact hydrogeologic nature of these deposits is dependent on the source material (granitic Sierra Nevada material vs. sedimentary Coastal Range erosion) and the depositional environment (fluvial, marine, and lacustrine). The most productive aquifer materials are the gravelly deposits left by streams that eroded the Sierra Nevada. The least productive aquifer materials are fine clays deposited either when the San Joaquin Valley was occupied by large lakes *or covered by an arm of the sea*.

Ground water in the Kern County Basin occurs under unconfined, confined and semiconfined conditions. Semiconfinement is caused in most of the basin by the presence of small, discontinuous clay lenses that slightly inhibit the movement of recharge water downward. Confined ground water occurs in portions of the basin overlain by identified confining clay layers (see "Geology", following).

Ground water flow in the Kern County Basin is also affected by faults and structural folds in the alluvial material. Two significant Kern County faults have been identified that restrict ground water flow. The White Wolf fault near the southern edge of the basin restricts flow to and from the alluvium to the south of the fault. The Pond Poso fault in the northeastern portion of the Kern County Basin is a less prominent fault that somewhat inhibits ground water flow. Flow is also influenced by folds in the alluvium such as the Semitropic and Buttonwillow Anticlines.

Before the twentieth century began, ground water in the Kern County Basin was only slightly developed. Ground water levels over much of the basin were at or near the ground surface, and artesian conditions existed over the portion of the basin underlain by confining clay layers (Mendenhall, 1916). Recharge then was derived from seepage from local streams, and discharge occurred into freshwater marshes and lakes located in the valley trough.

Since the early 1900s, significant development of irrigated agriculture has taken place in Kern County. At first, this development was based primarily on diversions of Kern River water, with limited use of artesian ground water supplies. Beginning in the period from 1900 to 1910, ground water pumps came into widespread use and, by the 1920s, pumpage exceeded the natural recharge of the basin (Cal. DWR, 1931). This condition of overdraft caused ground water levels in the Kern County Basin to decline, with locally severe declines in areas of heavy ground water pumpage and no surface water supplies. Ground water level declines in the confined aquifer also caused subsidence of the land surface in some parts of the basin. The Kern County Basin includes portions of the Tulare-Wasco subsidence area, where some lands subsided more than 10 feet between 1926 and 1970, and the entire Arvin-Maricopa subsidence area, which had a maximum subsidence of 9 feet in the same period (Poland, and others, 1975).

In response to lowered ground water levels, the Friant-Kern Canal was built in the 1950s. The canal delivers surface water to former ground water users in portions of Kern County. In the early 1970s, the SWP also began deliveries of surface water to former ground water pumpers in the Kern County Basin. These supplemental surface water supplies reduced existing overdraft but *coincided with a period of* increased basinwide development of irrigated agriculture, which prevented the complete elimination of overdraft conditions. At present, the demand for water exceeds supplies in Kern County as a whole by about 250,000 - 300,000 acre-feet per year. Projected shortages in SWP entitlement and reduced surplus deliveries, though, would increase the amount of overdraft.

Currently, ground water recharge in the Kern County Basin consists predominantly of the percolation of excess irrigation applications, with lesser contributions supplied by river and canal seepage, artificial recharge programs of water agencies, and municipal and industrial waste water. Direct recharge from precipitation is only a minor source of supply, because in most years the limited local precipitation is greatly exceeded by evapotranspiration.

Ground water quality in the Kern County Basin is extremely variable. Mendenhall, in 1908, noticed extreme differences in the chemical characteristics and general usability between ground waters from the east and west sides of the valley. In general, ground water from the west side of the valley has high mineral concentrations and is categorized as sodium sulfate or sodium chloride types. These chemical characteristics reflect the movement of ground water into the basin from marine sediments and limited fresh water recharge. In large parts of the west side of Kern County, the total dissolved solids (TDS) concentration of native ground water is above 1,000 parts per million (ppm), limiting its use for irrigation or domestic purposes. In the project area, this water type is largely restricted to a narrow band adjacent to the Elk Hills.

In contrast to the poor quality westside ground water supplies, the eastside water quality is generally good. The eastside ground water is generally of the bicarbonate type, either sodium bicarbonate or calcium bicarbonate. Its quality reflects the quality of its primary historical recharge source, the Kern River. Eastside ground water is generally of somewhat lower quality than the Kern River water, but in chemical characteristics it is similar. In coarse gravel deposits close to the river, the quality of the eastside ground water is very good, frequently less than 200 ppm total dissolved solids. Its quality drops off in areas farther from the river due to limited recharge in the less permeable deposits. Overall, the eastside ground water is very usable. This is the predominant water type in the project area.

Between the eastside and westside ground waters, a more variable type is found. The axial trough ground water type is a mixture of both eastside and westside ground water that also reflects the effects of percolation of excess irrigation. Generally sodium in type, the axial trough waters vary considerably from area to area and with depth.

The Kern County Basin as a whole is a closed basin with no natural outlet for surface or ground waters. Salts are brought into the basin by the surface water supply sources--Kern River, Friant-Kern Canal, SWP, and minor streams-- but are not removed. This condition of adverse salt balance is compounded by the impacts of leaching soluble salts from the soil into the ground water. These two processes inevitably increase overall salt content in the ground water basin. Historically, water quality degradation has been noticed in many wells in Kern County.

Ground water in the project area is partly axial trough and partly eastside type. Generally, the ground water along the western and southern boundaries of the project is poor and sometimes unusable. The best quality water is located in the northeast portion of the project site. To better define water quality variations in the project area, two contour maps of ground water quality pa-

rameters were prepared, based on analyses of water samples from 131 wells in and adjacent to the project area (Figures 10 and 11). The contours in these figures were determined using kriging. The analyses used in the kriging procedure were taken between 1951 and 1981 from wells of variable construction characteristics. The resulting contour maps represent the quality of productive ground water wells and not the quality of a specific aquifer.

Figure 10 shows contours of TDS in the project area. In this figure, the 600 mg/l contour lies at the western edge of the project area. Ground water quality improves east of this contour and is generally very good (less than 200 mg/l) east of Interstate 5.

Figure 11 shows contours of boron concentrations in the project area. Most of the project area has boron concentrations below 0.5 mg/l, a level at which sensitive plants start showing damage.

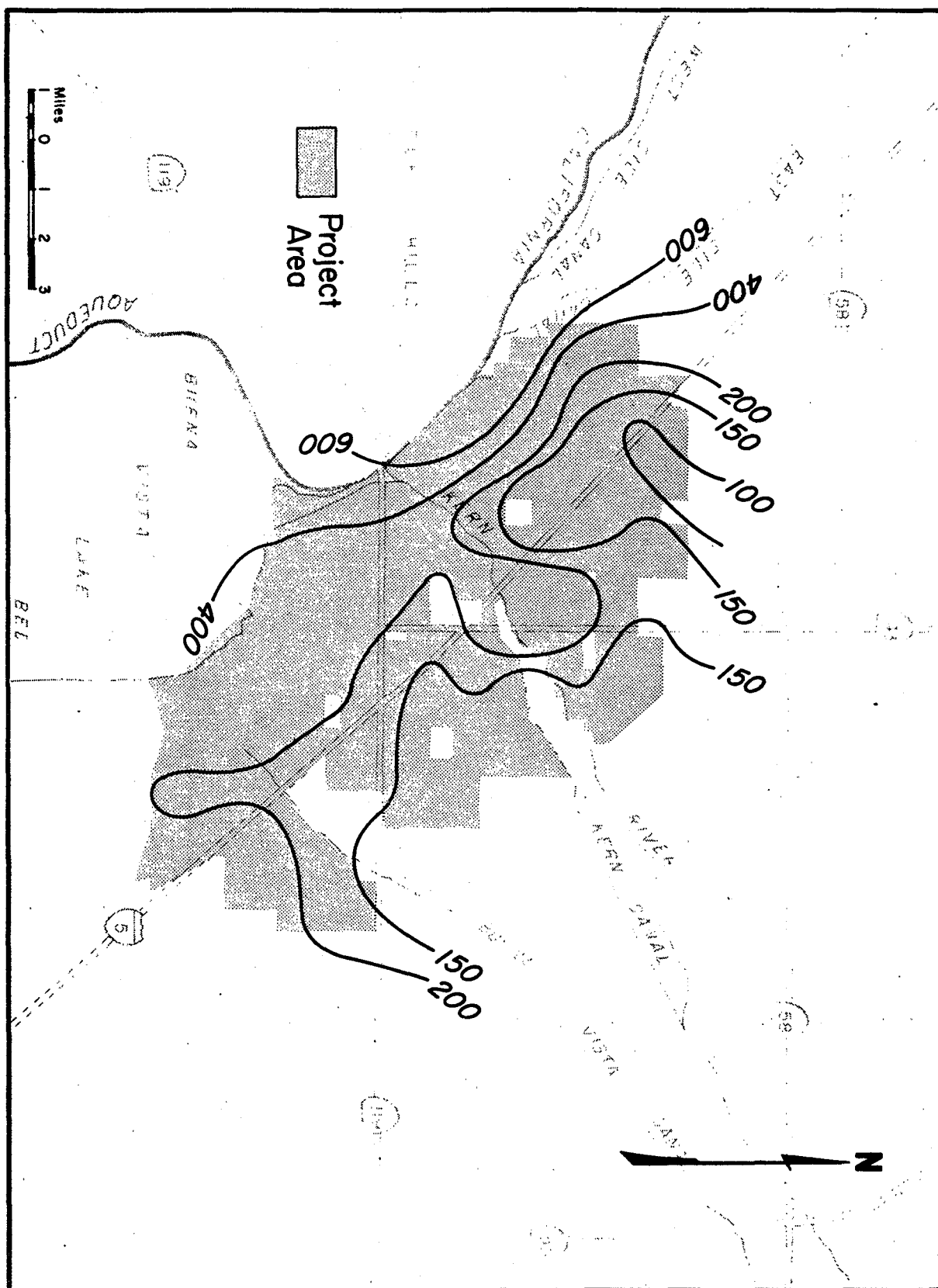
Geology

The project area is located in the southern portion of the San Joaquin Valley, a large, deep, asymmetrical sedimentary basin. The San Joaquin Valley is bordered on the south and east by the crystalline igneous and metamorphic rocks exposed in the Sierra Nevada and the Tehachapi Mountains. These rocks also underlie the basin at depth. To the west, the basin is bordered mainly by consolidated marine sedimentary rocks exposed in the Coast Range. These rocks are also found overlying the basement rocks within the basin. The occurrence of these rocks in the project area has been described in a general way by Hoots, Bear and Kleinpell (1954). These rocks play no significant role in the ground water basin.

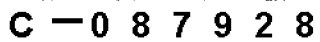
Overlying the marine sedimentary rocks in the basin is a thick series of continental rocks and semi-consolidated to unconsolidated sediments. These continental sediments which form the primary ground water basin are several thousand feet thick in the project area. However, the usable portion of this sediment accumulation is limited to that portion above the base of fresh water. Page (1971), using available electric logs and assuming that fresh water has a conductivity of less than about 3,000 micromhos, mapped the base of fresh water. He showed that the base of fresh water varies from an elevation of about -2,800 feet near the eastern portion of the project area to about elevation -800 feet adjacent to Elk Hills. The portion of the ground water basin above the base of fresh water is dominated by alluvial fan and lake deposits. Ground water development is limited to the upper portion of the fresh water system.

The near-surface geology of the project area is dominated by the alluvial fan that has been deposited by the Kern River. The fan alluvium consists of thick deposits of sand and gravel with extensive but discontinuous silt and clay beds (Dale, French, and Gordon, 1964). The sand and gravel, which represents old stream channels, tends to occur in sinuous interconnecting stringers and sheets that can be found throughout the fan but become less prominent toward the edges. These sinuous, highly permeable deposits are imbedded with less permeable silt and clay deposits. The fine-grained material becomes more extensive toward the edges of the fan and, in places, may interlace with relatively massive clay beds deposited in lakes. This may occur in the southwestern portion of the project area beneath Buena Vista Lake. The project area is bordered on the west by the consolidated rocks exposed in the Elk Hills. These rocks are considered to be essentially nonwater-bearing, although they do contain a small amount of poor quality water. Overall, the upper portions of the alluvial fan deposits form an unconfined to semiconfined aquifer system that can be expected to accept, store, and transmit large amounts of surface recharge.

Figure 10. LINES OF EQUAL TOTAL DISSOLVED SOLIDS IN
WELLS IN PROJECT AREA (mg/l)



C-087928



Two extensive clay layers are found in the Kern County Basin, the "A" clay and the "E" or Corcoran clay (Lofgren, 1975). The "A" clay is a shallow clay that is responsible for perched water conditions where it occurs at the bottom of the valley trough. The "A" clay occurs along the southern edge of the project area adjacent to Buena Vista Lakebed. The more extensive "E" clay underlies large portions of the Kern County Basin and acts as a vertical restriction to water movement. The "E" clay underlies about three-quarters of the project area at depths of 300 to 400 feet, creating a confined ground water aquifer below the western and southern portions of the project area. The distribution of the "E" clay layer in the vicinity of the project is shown in Figure 12. The presence of the "E" clay layer will somewhat limit the ability of the ground water system underlying the project site to store and transmit water that has been recharged. Currently, KCWA is testing the *aquifer in the vicinity of the City of Bakersfield's 2,800-acre recharge site to determine the extent of the hydraulic continuity in sand and gravel deposits imbedded with less permeable silt and clay deposits*. Additional studies may be necessary to further characterize the extent and nature of the "E" clay in the project area, including in-lieu sites.

There are no known faults or other barriers to lateral movement of water within or away from the project site, other than the consolidated rocks of Elk Hills and the thick clay beds underlying Buena Vista Lake. Knowledge of site-specific geology is limited at present but will be thoroughly investigated before implementation of a recharge program.

Seismicity and Related Effects

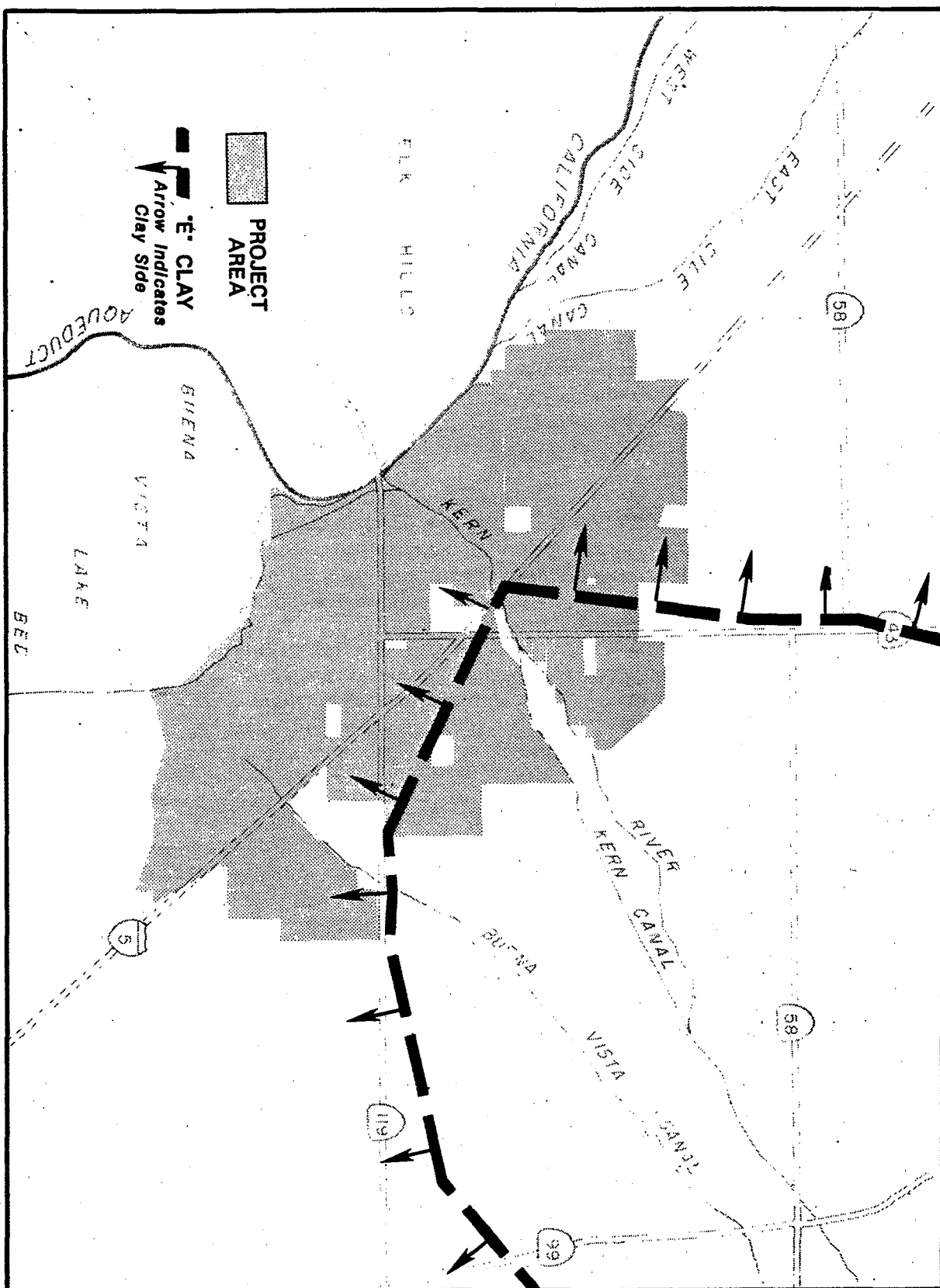
The primary geotechnical considerations in operating a ground water storage project are related to the possible effects of earthquake shaking. No major faults are present in the project site. However, the San Andreas fault, located approximately 25 miles to the west, is capable of generating an earthquake of magnitude 8+. Furthermore, the White Wolf fault (source of the 1952 magnitude 7.2 Kern County earthquake) is located about 15 miles southeast of the project site.

Greensfelder (1974) shows maximum probable bedrock accelerations of 0.3g to 0.4g could be expected in the project area from earthquakes generated on these faults. Actual accelerations could be somewhat higher than these estimates in poorly consolidated sediments. Potential seismic impacts include minor ground cracking and lurching and the possibility of liquefaction of sensitive sediments.

Liquefaction can occur in certain near-surface sediments (primarily silts and well sorted fine to medium sands) when saturated. Earthquake shock waves can cause a temporary loss of cohesion under such conditions. Soil conditions on the project site have not been evaluated; therefore, the potential for liquefaction problems cannot be determined at this time.

Seismic waves may also result in the development of seiches in the recharge basins. However, the shallow nature and limited areal extent of individual basins should prevent significant damage to the levees and other features.

Figure 12. EASTERN AND NORTHERN BOUNDARIES OF
THE 'E' CLAY LAYER IN THE PROJECT AREA



Vegetation

Approximately 35,000 acres of the 46,000-acre project site is either currently or has been previously in some stage of irrigated agriculture. The remaining acreage can be considered native vegetation. Much of the remaining acreage, however, has been disturbed by livestock grazing, as well as by oil exploration and drilling activities.

Historically, the southern San Joaquin Valley was a region of broad, arid plains with vegetation that included saltbush species and mesquite savannah. Riparian and marshland habitats were supported where water transected the site. Currently, three unique natural communities occur within the project boundaries: valley lowland saltbush scrub, valley sink scrub, and valley mesquite scrub (as defined by the California Natural Diversity Data Base).

Valley lowland saltbush scrub is characterized predominantly by plants such as *Atriplex polycarpa* and *A. spinifera*. Typically, this community has 25 to 40 percent cover, with the understory vegetation consisting of annual grasses such as bromes. This type of community is found in sandy loam soils with little or no surface alkalinity.

The valley sink community is characterized by plants highly tolerant to alkaline conditions, including such species as iodinebush (*Allenrolfea spp.*), saltgrass (*Distichlis spp.*), seepweed (*Suaeda spp.*), and dropseed (*Sporobolus airoides*). The predominant plant found in this community is iodinebush, a low-lying shrub usually providing 10 to 40 percent cover with a bare understory. This habitat is sparsely vegetated, occurring in areas where highly alkaline soils exist with characteristic white crust layers, especially along the margins of dry lakebeds.

The valley mesquite community is dominated by mesquite trees (*Prosopis juliflora var. torreyana*), a phreatophyte. Other plants found in this community include *Atriplex species*, *Haplopappus*, willows, and occasional cottonwood trees. This community is frequently associated with the valley lowland saltbush scrub found in sandy, loamy soils with low moisture.

Valley lowland saltbush scrub, found along the project site's northern boundary, is intermixed with the valley sink scrub in the same general location. Both communities are being threatened by encroachment because irrigated agricultural lands surround the natural area.

Several communities of valley mesquite scrub can be found within the project boundaries, many within oil drilling areas crossed by numerous roads, levees, and pipelines. Despite their location, some of these communities seem to be thriving under these unnatural conditions. Other communities, however, are not doing as well, especially those located adjacent to agricultural lands where declining water tables keep young saplings from becoming established and threaten the survival of the more mature trees.

The vegetation in and around the bypass and the Kern River flood channel include several species commonly associated with riparian habitats, such as buttonwillow and cottonwood trees. However, due to the lack of water flowing through the channels, the riparian vegetation community is not well established.

Endangered or Threatened Plants

The Department of Fish and Game (DFG) has the legal responsibility for the protection of rare or threatened plants in the State. The State Fish and Game Commission determines whether a plant meets the criteria for rare or endangered status. The California Natural Diversity Data Base, a part of DFG, inventories the locations of the State's rarest species (plants and animals) and natural

communities. In addition to DFG's legal responsibilities, there are other organizations concerned with the protection of California's sensitive plant species. The California Native Plant Society (CNPS), a private, nonprofit organization, publishes an inventory of rare and endangered vascular plants of California (1984). This inventory lists where the plant is found, its current State status (listing), and its Federal status, as well.

The California Natural Diversity Data Base was consulted to determine whether any sitings of rare and endangered plants have occurred on the project site. None have been found within the 46,000-acre boundary. However, one species, *Cirsium crassicaule* (slough thistle) has been observed along the Kern River, southeast of Tupman. While this species is not a State-listed plant, it is a U. S. Fish and Wildlife Service candidate species (meaning it is being considered for federal listing of threatened and endangered plants).

In addition to the slough thistle, listed below are sensitive plants (designated by CNPS) that could be found within the project boundaries because of the types of habitat in which they have been located and because they have been found previously in Kern County.

San Joaquin saltbrush, *Atriplex hastata* ssp. *spicata*
Bakersfield saltbrush, *Atriplex tularensis*
Lost Hills saltbush, *Atriplex vallicola*
Hispid bird's-beak, *Cordylanthus mollis hispidus*
California Caulanthus, *Caulanthus californicus*
Congdon's eatonella, *Eatonella Congdonii*
Kern mallow, *Eremalche kernensis*
Wooly-star, *Eriastrum Hooveri*
Cottony buckwheat, *Eriogonum gossypinum*
Comanche Point Layia, *Layia leucophaea*
Bakersfield cactus, *Opuntia basilaris* var. *treleasei*
Tulare pseudobahia, *Pseudobahia peirsonii*

All the above species are listed by the California Native Plant Society as rare or endangered in California and elsewhere. With the exception of *Atriplex hastata* ssp. *spicata* and *Eremalche kernensis*, each of these species is a candidate for federal listing on the U. S. Fish and Wildlife Service list of threatened and endangered plants.

Fish

Fish in the project area occur primarily in the numerous canals that cross the site, including the California Aqueduct and the Cross Valley, Pioneer, Alejandro, and Buena Vista Canals. When the lower Kern River is flowing, several fish species can also be found in the river. Fish are also found in the Buena Vista Aquatic Recreation Area, adjacent to the project area.

Known fish species occurring in the canals and the lower Kern River include such warmwater game fish as striped bass (*Morone saxatilis*), largemouth bass (*Micropterus salmoides*), smallmouth bass (*Micropterus dolomieu*), white catfish (*Ictalurus catus*), crappie (*Pomoxis spp.*), and bluegill (*Lepomis macrochirus*). Nongame fish species include carp (*Cyprinus carpio*), threadfin shad (*Dorosoma petenense*), hardhead (*Mylopharodon conocephalis*), and mosquitofish (*Gambusia affinis*).

Of particular concern to DFG is the possible presence of white bass (*Morone chrysops*) in the project area. Although this very aggressive game fish has not been found in any of the canals or waterways in the vicinity of the site, DFG samples the area frequently to ensure its absence from the area. White bass were illegally planted in Kaweah Reservoir in Tulare County, and DFG fears this fish could find its way north using waterways such as the Friant-Kern Canal and then rivers draining to the Delta.

Wildlife

A variety of wildlife can be found in and around the vicinity of the 46,000- acre project site. The types of wildlife found are normally associated with specific types of plant communities or habitats. Following are wildlife habitats located within the project boundaries and vicinity and the species of wildlife which can be expected to be found in these habitats.

Valley Mesquite-Saltbush Habitat

The low-lying shrubs and scattered mesquite trees provide habitat for a variety of mammals, birds, and insects. Chukar partridge (*Alectoris chukar*), western mourning dove (*Zenaidara macroura*), California quail (*Lophortyx californicus*), black-tailed hare (*Lepus californicus*), Audubon cottontail (*Sylvilagus audubonii*), and coyote (*Canis latrans*) are common inhabitants here. Where large, open expanses occur, meadowlark (*Sturnella neglecta*), red-tailed hawk (*Buteo jamaicensis*), Beechey ground squirrel (*Otospermophilus beecheyi*), pocket gopher (*Thomomys bottae*), and side-blotched lizard (*Uta stansburiana*) can be found. Grasshoppers, beetles, and other insects are abundant as well.

Riparian Freshwater Marsh Habitat

Riparian freshwater marsh habitat occurs within the project boundaries but it is uncommon due to the lack of fresh water available to sustain the habitat during the entire year. The wet areas that occur during the winter months are important sites for waterfowl and waterbird nesting and wintering. Species typically found include great blue heron (*Ardea herodias*), common egret (*Casmerodius albus*), mallard (*Anas platyrhynchos*), cinnamon teal (*Anas cyanoptera*), American coot (*Fulica americana*), northern harrier (*Circus cyaneus*), and numerous reptiles, amphibians, and mammals.

Agricultural Cropland Habitat

Irrigated agricultural cropland is not considered valuable habitat for wildlife. The modern "clean" farming practices that include eradication of weeds and natural growth have eliminated most suitable habitat for wildlife. This is especially true of the large acreages of cotton and barley; therefore, few species are attracted to these areas.

A few species, however, do utilize agricultural areas. These species include ring-necked pheasant (*Phasianus colchicus*), California quail (*Lophortyx californicus*), some songbirds, small rodents, and amphibians.

Thirty-four native tule elk currently inhabit the 975-acre Tule Elk State Reserve bordering the northwestern boundary of the project site. The elk provide transplant stock for the rest of the State. The reserve is open to the public (see **Recreation** section). It provides enough natural habitat to support about thirty animals for four months. Therefore, supplemental feeding is required.

Endangered or Threatened Wildlife

Several threatened and endangered wildlife species are known to occur within the project boundaries and vicinity. A threatened species is one whose prospects for survival and reproduction are in immediate jeopardy, while an endangered species is one whose numbers are relatively few but one that may survive, as long as habitat conditions remain stable.

The following is a description of four species of wildlife that may be found within the project boundaries, along with a brief description of habitat preference and State and/or Federal status.

San Joaquin Antelope Squirrel. The San Joaquin antelope squirrel (*Ammospermophilus nelsoni*) is a burrowing mammal which prefers areas of dry, mesquite-saltbush communities and associated grasses. This species feeds on forbs during the day and usually is associated with a colony. Encroachment of agriculture has been detrimental to this animal. It is currently listed as a State threatened species and a candidate for Category 2 on the Federal listing.

Giant Kangaroo Rat. The giant kangaroo rat (*Dipodomys ingens*) is a nocturnal rodent which can be found in dry, shrub-covered regions with abundant seed food supplies. An important prey for the San Joaquin kit fox, the two are often found in the same general locations. The giant kangaroo rat is a State threatened species and proposed for the Federal threatened species list.

San Joaquin Kit Fox. The San Joaquin kit fox (*Vulpes macrotis var. mutica*) is a small carnivore which also has been affected by agricultural encroachment. As stated above, it feeds on rodents such as the giant kangaroo rat, as well as insects. This nocturnal mammal makes dens by burrowing into convenient "hillsides", including canal banks, fence rows, and other levees. The kit fox is State-listed as threatened and Federal-listed as endangered.

Blunt-Nosed Leopard Lizard. The endangered blunt-nosed leopard lizard (*Gambelia silus*) is a large lizard which typically forms burrows in open areas with coarse, gravelly soils. The preferred food of the lizard includes insects such as grasshoppers. Agriculture and road construction have eliminated much of the prime habitat of this lizard. The blunt-nosed leopard lizard is listed as endangered by both DFG and the U. S. Fish and Wildlife Service.

The project site lies within the Blunt-Nosed Leopard Lizard Recovery Plan area identified by the U. S. Fish and Wildlife Service. The primary objective of this plan is to halt the decline of the blunt-nosed leopard lizard populations and to restore it to a nonendangered status. This goal will be attained when enough acreage has been secured to maintain self-sustaining populations in representative valley floor areas. The Plan has targeted approximately 30,000 acres in the San Joaquin Valley for acquisition to achieve this goal. Much of this targeted acreage falls within the boundaries of the proposed project site.

Oil and Mineral Resources

All or portions of the North and South Coles Levee, Ten Section, Canal, and Strand Oil Fields are located on the project site. *Table 4a illustrates the production and reserves of petroleum in these fields as of 1985.* Rights to oil, gas and other hydrocarbons will be severed and reserved by Tenneco West Incorporated. This mineral reservation will include reasonable rights of access to the surface to explore for and develop the mineral potential of the subject lands. Tenneco West Incorporated also has indicated the need for a water supply for purposes related to oil and mineral explorations.

No known or anticipated sand and gravel operations occur on the project site. Commercially suitable sand and gravel resources in the area are found to the north and east of Bakersfield. No other known mineral resources are present.

TABLE 4a
PETROLEUM PRODUCTION AND RESERVES IN 1985¹

Oil Field	Number of Wells		Oil & Condensate		Gas		Water	
	Producing	Shutin	Production (Bbl)	Reserves (Mbb)	Net Production (Mcf)	Reserves (MMcf)	Production (Bbl)	Injection (Bbl)
Canal	13	14	11,000	140	13,600	122	273,000	216,000 ²
Coles Levee, North	99	48	585,000	2,384	622,000	3,190	3,100,000	5,160,000 ³
Coles Levee, South	66	13	476,000	4,737	11,200,000	181,000	518,000	4,155,000 ³
Strand	18	34	43,000	299	50,000	207	678,000	787,000 ²
Ten Section	48	102	141,000	1,198	519,000	2,767	911,000	98,000 ²

¹Data from 71st Annual Report of the State Oil and Gas Supervisor—1985.

²Waste Disposal.

³Water Flood.

Social Characteristics

Population

All the land being considered for purchase is owned by Tenneco West Incorporated. These lands are situated in a rural area with no permanent residents on the property.

Housing

No permanent residential structures exist on the project site.

Transportation

The project area is traversed by three highways. Interstate 5 crosses the property in a northwest to southeast direction. State Route 119 crosses the middle of the property in an east to west direction. State Route 43 passes through the center of the property in a north to south direction.

Recreation

There are several recreational opportunities in the vicinity of the 46,000-acre project site. The California Aqueduct and the numerous canals occurring in and around the project site are popular fishing spots for many anglers. The Buena Vista Aquatic Recreation Area, southwest of the site, offers a wide variety of outdoor recreation activities. The facility is operated by the Kern County Parks and Recreation Department and is open all year. Activities include swimming, motor boating, fishing, camping, and picnicking.

The facility consists of two lakes. Lake Evans is a 86-acre impoundment primarily utilized for boat and shore angling. Kern County plants trophy-size rainbow trout in Lake Evans when water temperatures are low enough to sustain them, usually November through April. The 873-acre Lake Webb is used primarily for sailing and motor boating. Swimming is not permitted in either lake but is permitted in specially designated lagoons at the recreation area.

Bordering the project is the Tule Elk State Reserve, a 975-acre enclosure located northwest of Tupman, which currently houses 34 native tule elk. The reserve is operated and maintained by the California Department of Parks and Recreation. In addition to providing viewing of the elk, the reserve has day use picnicking facilities and provides presentations and tours to school groups. The reserve is open all year.

The City of Bakersfield's 2,800-acre ground water recharge area on the lower Kern River is popular with nature enthusiasts for bird watching and hiking. Horseback riding and picnicking are other activities enjoyed at the area, as well. Off-road vehicle use and hunting are prohibited. Security patrols and posted signs are present to discourage these activities.

Cultural Resources

Historically, waters from Sierra Nevada and coastal rivers and streams flowed into the valley lowland areas, creating Tulare, Buena Vista, and Kern Lakes. The lakes, now dry (except during large floods) due to upstream flood control projects, created ideal areas for several Yokut Indian tribes to camp, fish, and hunt. Yokuts were migratory and moved with the seasons and the availability of food. As a result of their activities, the project site is rich with archeological evidence. However, much of this evidence has been destroyed or lost due to agriculture, oil exploration, and road construction.

An archeological record search of the project site (Appendix 2) was conducted in April 1986 by the California Archeological Inventory Information Center of Bakersfield College. The search revealed that 18 known archeological sites exist within the project boundaries. Many of these sites, considered significant by archeologists, were discovered during surveys conducted in conjunction with oil drilling activities, telephone line installations, and related activities.

Five sites (Ker-668, -699, -1050, -1051, and -1052) located south of the Kern River on the eastern edge of the proposed project site were surveyed in conjunction with a proposed gas pipeline project. These sites were previously disturbed by various cultivation practices. One site included a dance house with evidence of human cremation, along with shell beads, chert flakes, and chipped stone artifacts. Other sites in this area revealed various shells, bone fragments, and basalt, chert, chalcedony, and jasper flakes.

Sites Ker-676, -677, and -679, located near the southeastern boundary of the project site, were accidentally discovered after they were uncovered by a severe wind and dust storm in December 1977. Upon further excavation, numerous shell beads, hand tool fragments, and obsidian, chert, and chalcedony flakes were uncovered. Bones from three to five humans were also discovered, suggesting that the area served as an ancient burial site.

Several archeological sites also have been found near the southwestern boundary of the project. Many of these sites, located near what is now the northern edge of the dry Buena Vista Lakebed, have revealed deposits of shell and glass beads, pottery shards, and animal bones.

One isolated site, Ker-1612, is located on the northwestern boundary of the project site near Tule Elk State Reserve. Several chert-silicate flakes were found, but the site is not considered to be significant.

Related Projects

Several existing ground water recharge projects are located in the vicinity of the project area. They are operated by Rosedale-Rio Bravo WSD, the City of Bakersfield, Buena Vista WSD, Kern Delta WD, and West Kern WD. Their operations are summarized below. In addition to these ground water recharge projects, KCWA serves as a coordinating organization facilitating direct and in-lieu ground water recharge in Kern County. KCWA is also responsible for the operation of the Cross Valley Canal, which crosses the project area. This canal is used to deliver water from the California Aqueduct of the SWP to various districts in Kern County, as well as federal CVP water, which is wheeled through the California Aqueduct.

Rosedale-Rio Bravo WSD lies adjacent to the project area on the north. The District uses the Goose Lake Slough channel, as well as several basins, to recharge available Kern River and Friant-Kern Canal supplies (Boyle Engineering Corp., 1980). In addition, Rosedale-Rio Bravo WSD contracted in 1966 to receive SWP deliveries with a 1990 level entitlement of 35,000 acre-feet. These SWP supplies are conveyed from the California Aqueduct near Tupman through the Cross Valley Canal to two turnouts adjacent to the District's southern boundary.

The City of Bakersfield has completed an EIR on the use of its 2,800-acre ground water recharge site, which is bordered on the north and south by the project area and includes lands on both sides of the Kern River (Stetson Engineers, 1983). Historically, recharge occurred primarily in the Kern River channel. The City has constructed several recharge basins on higher lands adjacent to the river channel. Recharge at the City's 2,800-acre site includes Kern River, Friant-Kern Canal, and SWP supplies of various Kern County agencies. These agencies have entered into agreements with the City that govern the use of the recharge sites. Basically, the City makes the re-

charge site available to other agencies at a nominal cost to cover the City's expenses. Once the water is recharged, the other agencies are responsible for recovering the stored supplies. Table 5 shows the historic recharge amounts in the Bakersfield facility.

Buena Vista WSD has historically recharged available Kern River, Friant-Kern Canal, and SWP water at several sites in and adjacent to the District. Two of the sites used in this recharge effort, the Kern River Channel below Second Point and the Main Canal, lie in the project area.

Kern Delta WD recharges water on an as available basis in wet years. The District's Kern River water right allows it to divert most of its surface supplies during the irrigation season, precluding the need for artificial recharge in most years. In extremely wet years, the District takes available surplus flows into its unlined distribution system and recharges them in relatively small recharge pits.

West Kern WD overlies an area of unusable ground water to the west and the southwest of the project area. The District maintains a well field in the western part of the project area and conveys pumped ground water from the field to the West Kern WD service area, primarily to oil fields and the city of Taft. With increases in the District's water demands, West Kern WD has recharged with purchased Kern River water and portions of its SWP supplies at various sites near its well field, primarily in the lower Kern River channel and the Buena Vista WSD Main Canal.

General Economic and Financial Setting

Local Government Finance

All the Tenneco West Incorporated lands are held under the Williamson Act, which provides for lower assessed property values and taxes if the land is kept in agricultural use for a period of ten years. The assessed valuation for 1985 was \$20,075,000 and taxes were \$200,750 (one percent of assessed value).

Kern County also receives revenue from Tenneco West Incorporated oil income. The County estimates future oil income, then levies a one percent tax (similar to a property tax) upon this expected income. Tenneco will retain mineral rights to these lands; therefore, the State purchase will have no effect on this revenue.

Land Use

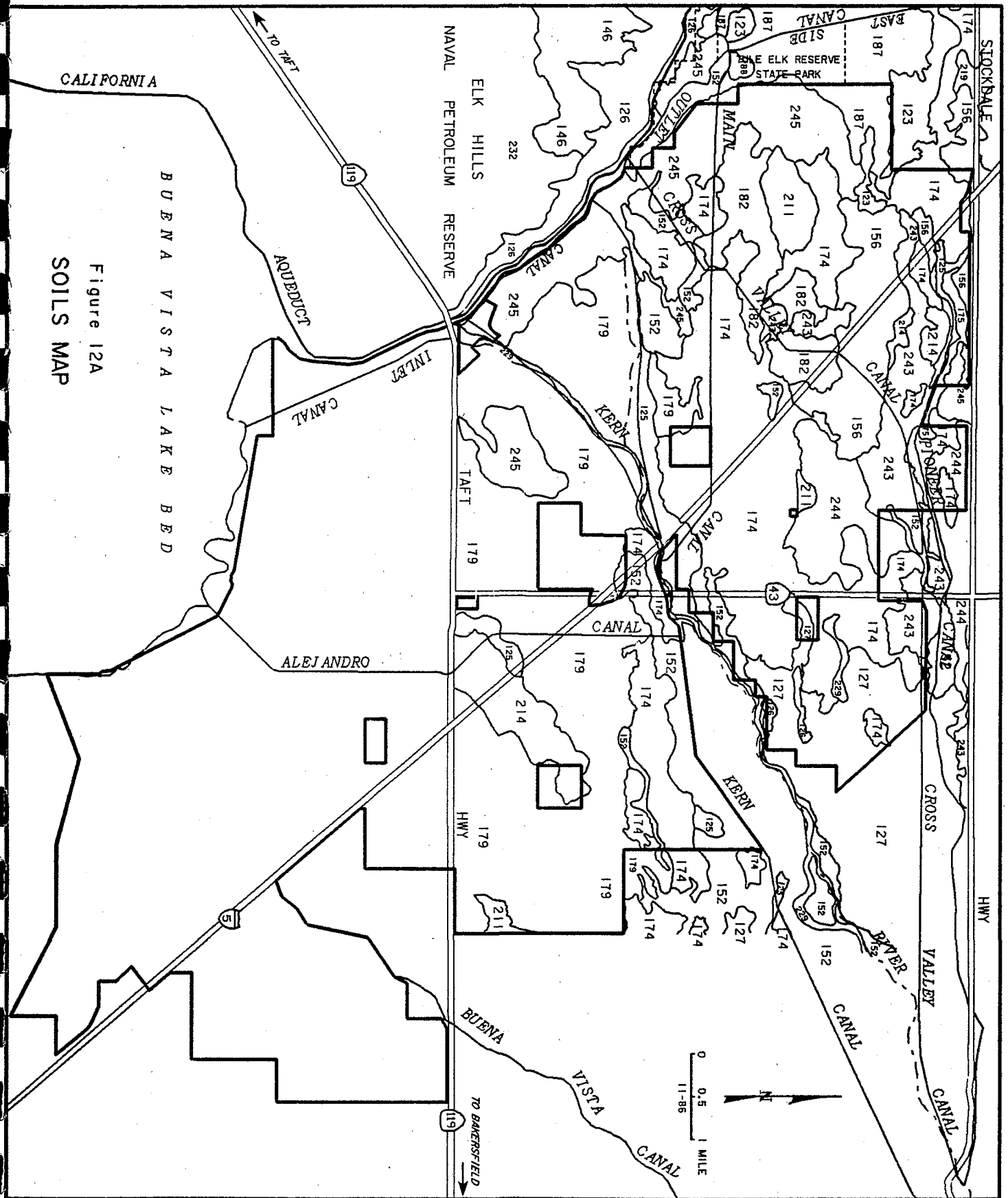
Table 6 tabulates the 1984 land use data of the Tenneco West Incorporated property in the project area. For the entire study area, almost 31,800 acres are agriculture-related *and appear to qualify as prime agricultural lands according to the U. S. Department of Agriculture (USDA), Soil Conservation Service definition. Based on USDA's land capability classification, all of the cropped, fallow, and idle lands fit into class I, IIs4, IIs5, IIs6, and IIIs6 (see Figure 12a).* Of this acreage, over 28,500 acres are currently in production. Of the total cropped acreage, field crops are the largest crop category, with almost 15,200 acres. Within field crops, cotton dominates with 13,500 acres. Over 10,000 acres of native vegetation are used as oil fields. Approximately 160 acres include oil production facilities. Figure 13 shows current land use in the project area.

Approximately 1,940 acres located within the study area are not owned by Tenneco. Of this amount, about 1,010 acres are owned by public agencies, 415 acres by oil companies, 7 acres by utilities, and about 510 acres by others (see Table 7).

TABLE 5
GROUNDWATER RECHARGE AT THE CITY OF BAKERSFIELD'S
SPREADING FACILITY
Banking Entities

Calendar Year	City of Bakersfield	Buena Vista W.S.D.	Hacienda W.D.	K.C.W.A.	Sub Total	Other Recharge	Grand Total
1977	0	0	0	0	0	0	0
1978	104,507	6,056	24,328	0	134,971	0	134,971
1979	4,505	9,913	0	0	14,418	59,076	73,494
1980	68,804	0	52,604	0	121,408	0	121,408
1981	2,603	0	4,465	44,912	51,980	7,141	59,121
1982	37,913	24,465	14,266	0	76,644	22,232	98,876
1983	113,380	0	0	0	113,380	0	113,380
1984	16,058	0	0	0	16,058	0	16,058
Jan-July 1985	402	0	0	0	402	0	402
Totals	348,252	40,434	95,663	44,912	529,261	86,449	617,710

Source: Kern County Water Agency



LEGEND FOR FIGURE 12A

SCS LAND CAPABILITY CLASS					
MAPPING SYMBOL	NON IRRIG.	IRRIG.	SERIES	TEXTURE	PERMEABILITY *(in./hr)
123	VII _s	II _{s6}	Buttonwillow	Clay	Slow to 28 in. depth (0.6—0.2)
125	VII _s	III _{s4}	Cajon	Loamy Sand	Rapid (6.0—20.0)
126	VII _c	----	Cajon	0—2% slope Loamy Sand	Rapid (6.0—20.0)
127	VII _s	III _{s4}	Cajon	2 to 5% slope Sandy Loam	Rapid (6.0—20.0)
146	VII _e	----	Elkhills	Overblown Sandy Loam	Moderately Rapid (2.0—6.0)
152	VI _s	II _{s3}	Excelsior	9—50% slope Sandy Loam	Moderate (0.6—2.0)
156	VII _s	III _{s3}	Garces	Silt Loam	Very Slow (<0.06)
174	VII _c	I	Kimberlina	Fine Sandy Loam	Moderately Rapid (2.0—6.0)
175	VII _e	II _{e1}	Kimberlina	Sandy Loam	Moderately Rapid (2.0—6.0)
179	VII _e	III _{s6}	Kimberlina	Fine Sandy Loam	Moderately Slow (0.2—0.6)
182	VII _s	III _{s6}	Lerdo Complex		
			70%Lerdo	Clay Loam	
				Saline—Alkali	Slow (0.06—0.2)
			20% Lerdo	Clay Loam	Moderately Slow (0.2—0.6)
187	VII _s	II _{s6}	Lokern	Clay	Slow (0.06—0.2)
211	VII _c	I	Panoche	Clay Loam	Moderate (0.06—2.0)
214	VII _s	II _{s6}	Panoche	Clay Loam	Moderately Slow (0.2—0.6)
229	VIII	----	Riverwash	Saline—Alkali (Sand & Gravel)	-----
232	VII _e	----	Elkhills	Varies from Sand	Moderate—Slow to
				to Silt Loam	Moderately Rapid (0.2—6.0)
243	VII _s	II _{s4}	Wasco	Sandy Loam	Moderately Rapid (2.0—6.0)
244	VII _c	I	Wasco	Fine Sandy Loam	Moderately Rapid) (2.0—6.0)
245	VII _c	I	Westhaven	Fine Sandy Loam	Moderately Slow (0.2—0.6)

*USDA Soil Conservation Service

TABLE 6
1984 LAND USE OF PROJECT SITE

LAND USE	ACRES	
Agricultural		
Grain Crops		3,346
Field Crops		
Cotton	13,553	
Sugar Beets	558	
Milo	375	
Dry Beans	741	
Subtotal		15,227
Pasture		
Alfalfa	9,161	9,161
Truck Crops		
Carrots	237	
Melons	14	
Subtotal		251
Double Cropped		
Grain-Corn	110	
Grain Milo	148	
Grain-Carrots	61	
Sugar Beets-Corn	131	
Grain-Alfalfa	71	
Subtotal		521
TOTAL CROPPED ACREAGE		28,506
Fallow		1,428
Idle		1,824
Farmsteads		37
TOTAL AGRICULTURAL LANDS		31,795
Urban	114	
Urban-Industrial	59	
Urban Total	173	173
Water Surface	0	
Native Vegetation	15,693	
Subtotal		15,693
TOTAL LAND USE		47,931

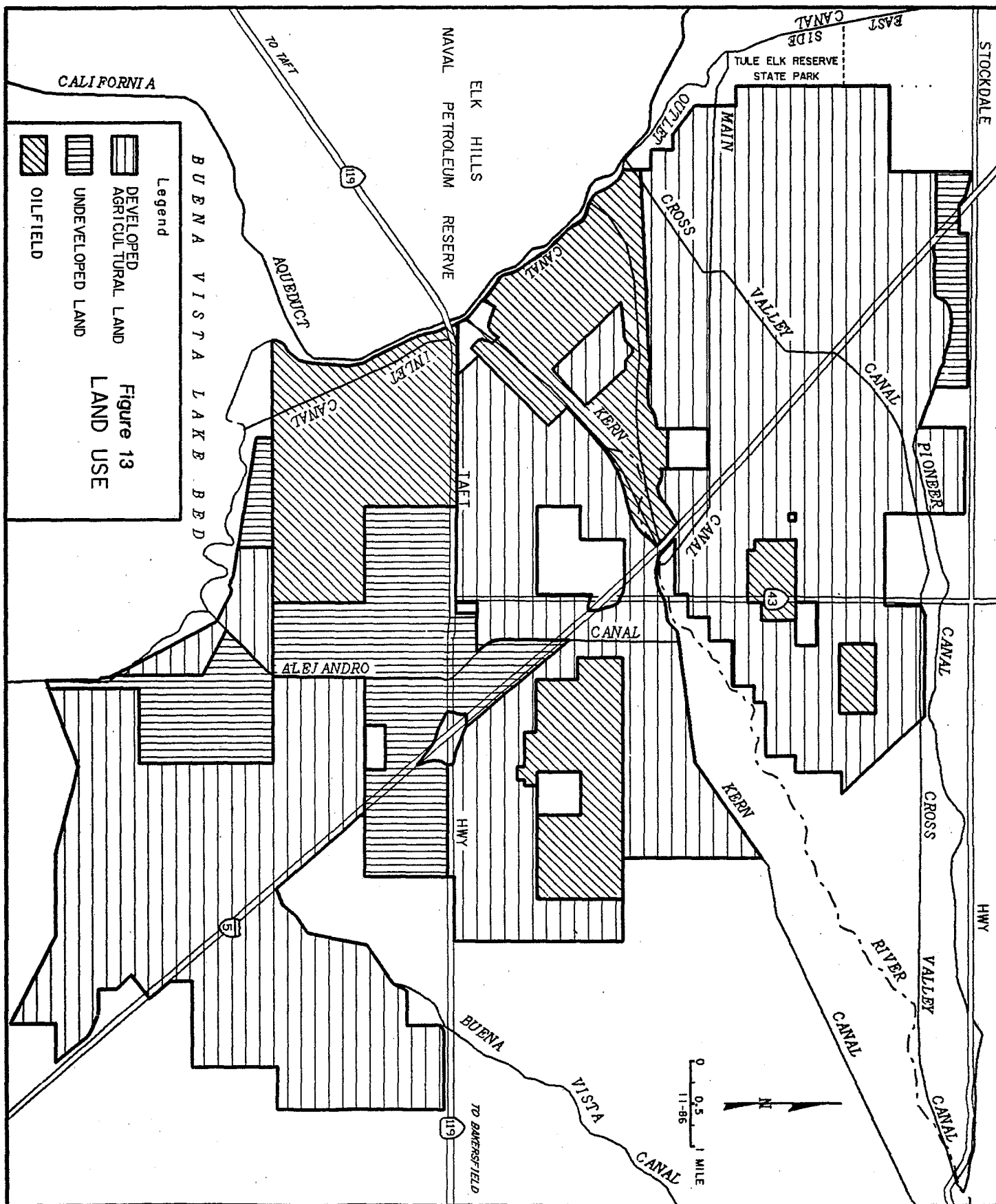


Figure 13
LAND USE

TABLE 7
OTHER OWNERSHIPS WITHIN THE PROJECT AREA

OWNER	ACRES
Oil Companies	
Atlantic Richfield	18.1
Chevron	237.0
Shell Oil	160.0
Subtotal	415.1
Utilities	
Pacific Gas and Electric	— ¹
Southern Pacific	6.7 ¹
Subtotal	6.7 ¹
Public Agency	
City of Bakersfield	722.0
Henry Miller WD	21.5
Kern County WA	107.4
West Kern WD	160.0
Subtotal	1,010.0
Other	510.1
TOTAL	1,942.8 ¹

¹Does not include parcels in which acreages were not given an ownership role.

A portion of the project site has been dedicated for future use as a land disposal site for treated waste water effluent from the City of Bakersfield's Southwest Sewer Plant No. 3. An agreement between the City and Tenneco West Incorporated allows approximately 4,700 acres, located in the southwest portion of the project site and adjacent to Interstate 5, east of the Alejandro Canal, to be used for land disposal of the City's treated effluent. As the amount of treated effluent increases in the future, it will be used to irrigate field and grain crops at the site. The environmental impacts of disposal at the site were evaluated in Quad Consultants' February 1982 *Draft Environmental Impact Report, City of Bakersfield Plant No. 3 Wastewater Treatment Expansion and Disposal Alternatives*.

Business and Industrial Activity

About 160 acres of the Tenneco West Incorporated property is used for urban-industrial purposes, primarily related to oil production. All other developed acreages are in agricultural production.

Public Health Considerations

San Joaquin Valley Fever

San Joaquin valley fever (also known as *Coccidioidomycosis*) has its highest incidence in Central California. The principal cause of valley fever is a fungus called *Coccidioides immitis*, which typically lives about two inches below the soil surface.

This fungus can cause problems at any time but is most potent when a long, hot summer results in a layer of dry, nearly weightless spores beneath the surface. Once the soil surface is broken, usually by agricultural activity or burrowing animals, the spores become airborne. If inhaled by humans, the spores can attach to lung tissues and create pod-like growths that are filled with hundreds of fungal spores. When the growths burst, these spores spread throughout the lungs and, in severe cases, to other organs, including the brain. When valley fever spreads to the brain, it can be fatal.

Vectors

Mosquitoes are very common within the project site. Five species in particular occur in abundance and can cause health and nuisance problems. They are *Culex tarsalis* (the encephalitis mosquito), *Aedes melanion*, *Anopheles freeborni* (the western malaria mosquito), *Anopheles franciscanus*, and *Culiseta inornata*.

The project site falls within the jurisdiction of two local mosquito abatement districts (Kern and Westside Mosquito Abatement Districts), which monitor and, when necessary, eradicate mosquito larvae and adults. The Districts use a variety of techniques to eradicate mosquito larvae, including mosquitofish (*Gambusia affinis*), biological sprays such as *Bacillus thuringiensis* var. *israelensis* (BTI), and chemical larvicides. For adult mosquito eradication, several chemical insecticides are employed, such as Baygon.

During years of heavy precipitation, many areas are flooded, particularly along the Kern River. This situation creates ideal conditions for mosquito propagation. Canals and open water areas (such as rice fields) are fairly easily treated with mosquitofish and/or insecticides. Other areas with dense vegetation, such as the lower Kern River, are more difficult to treat and eradication is less successful. Aerial applications of insecticides to these areas are not always effective because the dense vegetation often blocks the watercourses, keeping the insecticides from reaching their intended targets.

Chapter 4. ENVIRONMENTAL EFFECTS OF THE PROPOSED ACTION DETERMINED TO BE LESS THAN SIGNIFICANT

Construction and Operation Impacts

Operation of heavy equipment during construction of the spreading, conveyance, and extraction facilities will increase dust and noise in the project area. No residential areas exist near the project site; therefore, the impacts of these disturbances will be minimal.

During construction, project workers may be exposed to San Joaquin valley fever. This disease is spread by the inhalation of fungal spores that lie in dry valley soils and is especially dangerous to persons from outside the San Joaquin Valley. Although a project worker may contract valley fever, it should be noted that this risk exists for most earthwork done in the valley and the likelihood of contracting this disease during project construction is no greater than for any other farming or earth-moving project in the Valley. In fact, reduction of irrigated agriculture in most of the project area may reduce overall exposure to the disease-causing spores. No substantial adverse effects on the environment are expected in regard to this issue.

Several utilities cross or overlie the project areas, such as oil and gas pipelines, electrical transmission facilities, and telephone lines. Some of these facilities could be damaged disrupting service to neighboring areas, if precautions are not taken. To prevent such disruption, DWR construction contract specifications require the contractor to protect existing utility facilities.

The SWP recharge project is not expected to change public access to the project site significantly. Currently, most of the project site is irrigated cropland in which hunting and trespassing are prohibited. Accessibility is limited by local roads that are poorly maintained. Most of these areas would revert to native vegetation that may be fenced to discourage hunting, off-road vehicle use, and grazing by domestic animals. Limited waterfowl hunting may be permitted.

Additional roads may be constructed and existing roads improved to provide access to project spreading and extraction facilities. These project roads would be gated to discourage public access. Portions of the spreading basins may be opened during hunting season for use by duck hunters to prevent rafting of waterfowl at the project site. Extraction facilities would be fenced to discourage vandalism, and conveyance facilities also would be fenced. Much of the project area is currently used for intensive oil production and the numerous oil wells are connected by pipelines and service roads. Neither the spreading basins, conveyance facilities, nor extraction facilities would be located in these areas, and access to oil production facilities would be left unchanged.

The proposed SWP recharge program would increase energy use. These increases would be the result of Aqueduct pumpage for increased SWP water deliveries, pumpage to convey Aqueduct water to the recharge sites, and pumpage to extract stored ground water. Estimates of the amount of energy that will be used were based on flow amounts obtained from the project operations studies discussed in Chapter 2. The total increase in energy use over the thirty-year project repayment period could be as high as 22,900 million kilowatthours. The energy saved by reducing ground water overdraft over the same period is about 804 million kilowatthours.

The additional energy required by the project would be obtained from sources identified in DWR's long-range energy program which ensures energy for operation of the SWP. The energy program includes power derived from both hydroelectric and thermal sources. Specific measures in the thermal sources have been incorporated to limit emissions. The additional energy requirements of the project will not cause significant impacts on the environment.

During construction, additional energy in the form of gasoline and diesel fuel supplies will be used. Manufacture and transport of some components of the project (concrete, pipe, structural steel, etc.) will also require energy.

Several Kern County water agencies recharge water in the vicinity of the project area. Two of these agencies, Rosedale-Rio Bravo WSD and the City of Bakersfield, maintain large recharge sites very near the project area. Rosedale-Rio Bravo WSD recharges surface supplies in the Goose Lake Slough and several adjoining spreading basins about one mile north of the project area. The City of Bakersfield recharges surface water at its 2,800-acre spreading site, which is partially surrounded by the project area.

As discussed in the project description in **Chapter 2**, the exact location of the approximately 3,500 acres of percolation basins that may be constructed for the SWP recharge program is not known. However, the potential exists for the proposed recharge project to impact adjacent recharge sites. *Negotiations are being conducted for coordinated operation of existing and proposed recharge facilities which would minimize potential interference.*

In the ground water model projections made to simulate the effects of the SWP recharge program, the operations of both the Rosedale-Rio Bravo WSD and the City of Bakersfield recharge program were included. These projections showed that there are some times when the SWP program might interfere with the adjacent recharge projects. This interference could be caused by mounding under the project area prior to a series of local wet years. The generally higher ground water levels in the project area that would result from SWP recharge operations could reduce the storage capacity available to adjacent recharge projects. To minimize this potential impact, ground water levels under the project site would be closely monitored to prevent excessive mounding. Agreements with other recharge agencies may be negotiated to establish maximum allowable water levels in the project area.

During times of heavy extractions, water levels in some locations may be lower than they would be in the absence of the project. These effects, while minor, are expected to be most prominent in the Rosedale-Rio Bravo WSD.

The use of 3,500 acres of basins (including those operated by the City of Bakersfield) for artificial ground water recharge could cause mosquito-associated problems by creating more habitat for mosquito larvae. Increases in the current mosquito populations could result in greater nuisance problems and also create increased health risks associated with diseases carried by mosquitoes, including encephalitis and malaria.

Mitigation. The mitigation for increased emissions and dust is included in the Air Quality section.

The potential risk of contracting Valley Fever should be specified in all construction contracts. Construction workers should be advised of the potential risk as a condition of employment.

Should water level declines require mitigation, it could be accomplished by expanding surface distribution systems into adjacent districts, thereby, lessening the need for local pumping during periods of heavy extraction. The expansion of surface distribution systems also would create the opportunity for in-lieu recharge in times of abundant water supply. Another alternative would be to deepen existing wells.

In general, the recharge at the project area would be scheduled at a different time than that of adjacent local projects. The local projects recharge large amounts of water primarily when Kern

River flows are high, while the proposed project will recharge California Aqueduct supplies that will be available in many years when significant amounts of Kern River supplies are not available for recharge. In addition, recharge amounts in the project area's percolation basins could be adjusted during operation to minimize interference with nearby recharge programs. Ground water levels under the project site would be closely monitored and the amount of recharge reduced, if necessary, to prevent excessive mounding.

Several measures would be taken to mitigate possible mosquito-related problems. The Department of Water Resources would contract with the appropriate mosquito abatement district (either Kern Mosquito Abatement District or Westside Mosquito Abatement District) to provide adult and larvae mosquito monitoring, mosquitofish planting, and, if necessary, eradication of the larvae and/or adults. The mosquito abatement districts would also recommend operation and maintenance procedures that could include levee placement, side-slope and water requirements, and vegetation control.

Tentative plans for the recharge basins are to operate them in a series so that if a pond becomes plugged (percolation rates become too low), the water in that pond could be drained into the next one. This would allow for the reuse of mosquitofish rather than costly replanting of fish from depleted supplies.

Every attempt would be made to keep the mosquito situation from becoming either a health hazard or a nuisance. If the mitigation measures described above are implemented, no significant impacts are expected as a result of this project.

Air Quality

The project could potentially impact air quality as a result of activities related to the construction of the recharge basins and associated levees and roads. These activities may temporarily increase emissions and generate dust associated with the heavy equipment use. Dust concentration and composition, from such activities will generally be comparable to those produced by agricultural operations, such as disking. Initial construction activities will increase vehicle emissions and dust conditions, but they are expected to be of short duration and the increase is expected to be minimal.

Routine maintenance of the recharge basins would involve periodic reconditioning of the basins. This activity could generate increased dust conditions as well. Reconditioning of the recharge basins will occur on up to 900 acres at any given time. Adverse impacts associated with reconditioning are expected to be minimal.

Mitigation. Tentative plans for the project site, following land acquisition, would be to remove all or most of agricultural production prior to construction of a project. The elimination of agricultural activities would improve air quality in the area and create a more favorable environment within the project boundaries.

Surface Water and Ground Water Quality

The SWP recharge program is not expected to impact surface water quality. Kern River flows occur in the project area only during periods of high flow. There would be no direct connection between project facilities and the Kern River channel.

The quality of the surface water ponded in the percolation basins is expected to be similar to that of the SWP recharge water. One parameter that has caused problems in ponded water on other

parts of the San Joaquin Valley is selenium derived from agricultural drainage. Dangerously high selenium concentrations have occurred at several sites in the valley due to a combination of high selenium levels in influent drainage water and high concentrations of selenium at pond sites from evaporation. The SWP percolation basins would not concentrate selenium since the California Aqueduct recharge water would have low selenium levels (less than .001 mg/l), and the porous soils at the recharge sites also would ensure that selenium is not concentrated by evaporation in the basins.

The water recharged by the proposed project generally will be of slightly higher salinity than the existing ground water in the project vicinity. The electrical conductivity of ground water (a general indication of salinity) in the project area currently ranges from about 200 to 400 micromhos. The electrical conductivity of California Aqueduct water averaged about 370 micromhos between 1980 and 1984. The primary use of ground water in the project vicinity is for irrigation. The irrigation guidelines reported in the Food and Agricultural Organization's publication, "Water Quality for Agriculture", classify water supplies with electrical conductivities below 750 micromhos as being no problem for crops. California Aqueduct water would, therefore, not significantly alter existing ground water.

Another important indicator of the suitability of water for irrigation is boron. Since the California Aqueduct's average boron concentration of 0.2 ppm is generally below the 0.2 to 0.5 ppm boron range of existing ground water, recharged ground water would improve boron concentrations.

Finally, the overdraft correction aspect of the project would benefit local ground water quality. Water quality to the south and west of the project area is considerably poorer than that in the project area itself. Water levels in the project area will generally be higher than in the absence of a project. These high levels will inhibit the migration of poorer quality water into the project area.

Mitigation. Water delivered for recharge is generally high quality, and no significant water quality impacts are expected. Project operation will not adversely impact surface water quality. Therefore, no mitigation is required.

The total dissolved solids content of water delivered for recharge is slightly higher than that of ground water at the project site. However, the water is suitable for irrigated agricultural use and municipal and industrial use with normal treatment. It is of better quality than the irrigation return flows that will be eliminated by removing land from production. Therefore, no significant impact on ground water quality is expected.

Water quality will be carefully monitored during the recharge process with special attention to possible bioaccumulation of trace elements. Water quality monitoring of ground water through the project area will be conducted regularly, as will the quality of water pumped for delivery. In the event that significant water quality degradation occurs, project operations could be modified to minimize the movement of the water. If necessary, the affected water could be extracted and treated.

Ground Water Effects

The direct impacts of the ground water recharge and storage program will be on ground water levels and flows in and adjacent to the project site. To predict these impacts, a preliminary ground water modeling analysis was made based on the Surface Water Allocation Model (SWAM) and Ground Water Model (GWM) of DWR's San Joaquin Valley Ground Water Study. With this modeling system, future ground water conditions were predicted, based on several different operational and hydrologic assumptions. *The effects described in this section are based on output from the SWP*

model for maximum average deliveries for year 1990 conditions as described in Chapter 2. Response of the ground water basin to reduced monthly recharge amounts will be similar. This discussion of the projected ground water conditions addresses the following topics:

- Operational assumptions made in the ground water projections.
- The GWM network and geologic parameters used to project Kern County ground water levels.
- The SWAM network and hydrology used to predict future ground water conditions.
- Results of ground water level projections and a discussion of their implications for a ground water recharge program.

Operational Assumptions

The San Joaquin Valley GWM and SWAM were both used to predict future ground water conditions in the project area. For these projections, three different conditions were assumed:

- A base case with continued irrigated land use in the project area and no SWP recharge program.
- An analysis of the effects of removal of irrigated agriculture from the project area and no SWP program.
- SWP purchase of the project area, with removal of irrigated agriculture and implementation of a recharge-extraction program.

For each assumption, two computer projections were made using two different 30-year hydrologic periods. The first period extends from 1922 through 1951 and includes the seven-year (1928-1935) dry period near the beginning of the projection. This hydrologic period is somewhat extreme in drawing down water levels since heavy withdrawals occur in the first 15 years of the projections. The last 15 years of the first period are relatively wet years, allowing basin ground water levels to recover.

The second hydrologic period begins with the years 1963 through 1978 and continues with the years 1922 through 1935. This period begins with 15 relatively wet years when ground water recharge from the proposed SWP project (as well as existing local projects) is high. The first part of this hydrologic period thus provides a test of the feasibility of recharging large amounts of water coincident with large local recharging efforts. The last 15 years of this hydrologic period include the seven-year critical period.

In addition to the assumptions cited above, several assumptions were made that are common to all the ground water projections. These assumptions are as follows:

- The initial year of the ground water level projections was assumed to be 1983.
- Agricultural land use in the San Joaquin Valley corresponds to Scenario III projections in the San Joaquin Valley Ground Water Study: Third Progress Report (Cal. DWR, 1985).
- Water supply in non-ground water areas was kept at long term average levels used in Scenario III projections. Land use in these areas is limited to the amount that can be supported by surface water supplies. Variation of surface water supplies in these non-ground water areas would result in expansion or contraction of irrigated land use. Since the land use projections were not made with a variable water supply, the SWAM would deal with water supply variations by pump-

ing ground water in dry years or intentionally recharging water in wet years. Maintaining surface water levels at average conditions ensures that the impact on ground water levels is reasonable.

- SWP water supply in the remainder of Kern County was taken from the Division of Planning's statewide reservoir operations studies (Department of Water Resources) previously described in **Project Operation in Chapter 2**.
- City of Bakersfield's 2,800-acre site was assumed to recharge Kern River and Friant-Kern Canal supplies.
- Rosedale-Rio Bravo WSD's Goose Lake Slough was assumed to recharge its SWP deliveries, as well as Kern River and Friant-Kern supplies.
- Within the project site, Kern River diversions at low flows represent water purchased from the City of Bakersfield and were assumed to be used by Rosedale-Rio Bravo WSD. Kern River diversions at higher flows were retained at the project site.

SWP recharge to the project site was applied to the northern and eastern portions of the project site. As discussed previously in **Project Facilities in Chapter 2**, the exact site of these spreading basins is not known but their general location is. Extraction of stored ground water was assumed to occur in the same areas as the recharge, although control of the ground water depression during extraction periods may require that wells be more widely dispersed.

Ground Water Model (GWM) Description. The GWM used in the projections is a modification of the model developed in DWR's San Joaquin Valley Ground Water Study and described in several reports (Cal. DWR, 1982; McLaughlin, 1982; Cal. DWR, 1985). The GWM developed in that study is a finite element model that simulates aquifer flow in (1) an unconfined aquifer lying above the "E" clay layer and (2) a confined aquifer lying below the "E" clay. Much of the eastern portion of the valley is simulated in the GWM as a one-layer forebay region because of the absence of the "E" clay as a barrier to vertical flow.

In adapting this valley-wide model to project ground water conditions in the study area, two model modifications were made. The model was restricted to include, primarily, the Kern County Basin portion of the valley, and the finite element network was modified in the vicinity of the project site. The separation of the Kern County portion of the model was made somewhat north of Kern County's northern boundary, generally along the Tule River and the northern edge of Tulare Lake. The area north of Kern County was included in the model to provide a buffer against boundary impacts of the remainder of the valley. Projected ground water levels at the northern boundary were taken from Scenario III water level projections described in Cal. DWR, 1985.

In Scenario III, SWP supplies are modified from year to year to reflect changes in project facility availability, upstream demand reductions in yield, and other factors. Local and CVP supplies remain constant, with the exception of the existing CVP exchange deliveries through the Cross Valley Canal, which are contracted through 1995. Precipitation and evapotranspiration are assumed to be average during the entire projection period.

Besides separating the Kern County Basin from the remainder of the valley, the GWM used to project water levels in the study area also uses a more detailed finite element network (Figure 14). This network includes additional elements to approximate project area boundaries. The revised network also includes representation of the City of Bakersfield's 2,800-acre recharge site, as well as Rosedale-Rio Bravo WSD's Goose Lake Slough recharge site. References to the GWM in the remainder of this discussion will refer to the modified version.

Geologic parameters in the GWM are based on DWR analysis of data from well drillers' logs, as modified during model calibration. Specific yields are based directly on averages from well drillers' log reports. Conductivities were initially based on computed specific yield, using a parabolic relationship; these values were in some cases adjusted during calibration. GWM horizontal unconfined conductivities range from 8,000 to 20,000 feet per year in the project area.

Representation of the thickness, elevation, and the extent of the "E" clay in the GWM are based on U.S. Geological Survey and DWR analysis of electric logs and drillers' logs in the area. The eastern boundary of the "E" clay in the project site, as simulated in the GWM, is shown in Figure 14. Besides the "E" clay, other confining clay layers, such as the 300-foot clay layer identified by the U. S. Geological Survey (Dale, French and Gordon, 1966) beneath the City of Bakersfield, are known to exist in the vicinity of the project. These clay layers are represented in the GWM by a layer approximately 300 feet below the surface that extends to near the City of Bakersfield. This confining layer has a vertical conductivity in the GWM somewhat higher than that of the "E" clay. The base of the confined aquifer in the GWM is set at the bottom of the deepest wells in the area, as identified from well drillers' logs.

The valley-wide GWM was calibrated initially by Resource Management Associates (RMA) for a 1970-77 calibration period. This calibration is summarized in *The Hydrologic-Economic Model of the San Joaquin Valley* (Cal. DWR, 1982). A more recent recalibration of the GWM is found in Cal. DWR, 1985. Both calibrations were based on hydrology developed for the large Kern Delta Detailed Analysis Unit (DAU 254). Ground water level calibrations were obtained using kriging methods to process available ground water levels. During the calibration process some geologic parameters were adjusted to achieve a better correlation between predicted and observed ground water levels. These calibrated geologic parameters were distributed to elements in the more detailed network used in the ground water level projections in this EIR.

SWAM Network and Hydrology. The SWAM is a pre-processing program that estimates ground water pumpage and recharge by Detailed Analysis Unit (DAU) for use by the GWM. The original SWAM is described in two reports (Cal. DWR, 1982; McLaughlin, 1982) and subsequent modifications have been documented in a later report (Cal. DWR, 1985). The SWAM is basically an accounting program that performs a budget of surface water supplies and water use to estimate ground water pumpage and recharge.

To facilitate the SWAM's use in projecting ground water pumpage and recharge in the project area, a number of modifications were made to the SWAM network used in previous DWR studies. The DAU containing the project site (DAU 254) includes the entire Kern Delta area. For ease of analysis, this DAU was divided into the five pseudo DAUs shown in Figure 15. These pseudo DAUs are DAU 354 (Kern Delta WD, KCWA Improvement District No. 4, and adjacent areas), DAU 454 (Rosedale-Rio Bravo WSD), DAU 554 (the project site), DAU 654 (Henry Miller WD), and DAU 754 (the City of Bakersfield's 2,800-acre site). Addition of these new DAUs also required increased detail in the SWAM surface channel network to depict movement of surface supplies. The revised SWAM network for Kern County is shown in Figure 16.

Data required to use the SWAM were obtained from several sources. As discussed above, two hydrologic periods were used for the projections of ground water conditions. The first period begins in 1922 and continues through 1951. The second period begins in 1963 and continues through 1978 and then begins again with the 1922 hydrologic conditions and continues through 1935. The first period was selected to evaluate the effect of having the historic critical dry period (1928-34) occur early in the operation period. The second period was constructed to evaluate the effects of the critical dry period occurring at the end of the operation period.

Figure 14. MODIFIED GWM NETWORK ELEMENTS IN VICINITY OF PROJECT

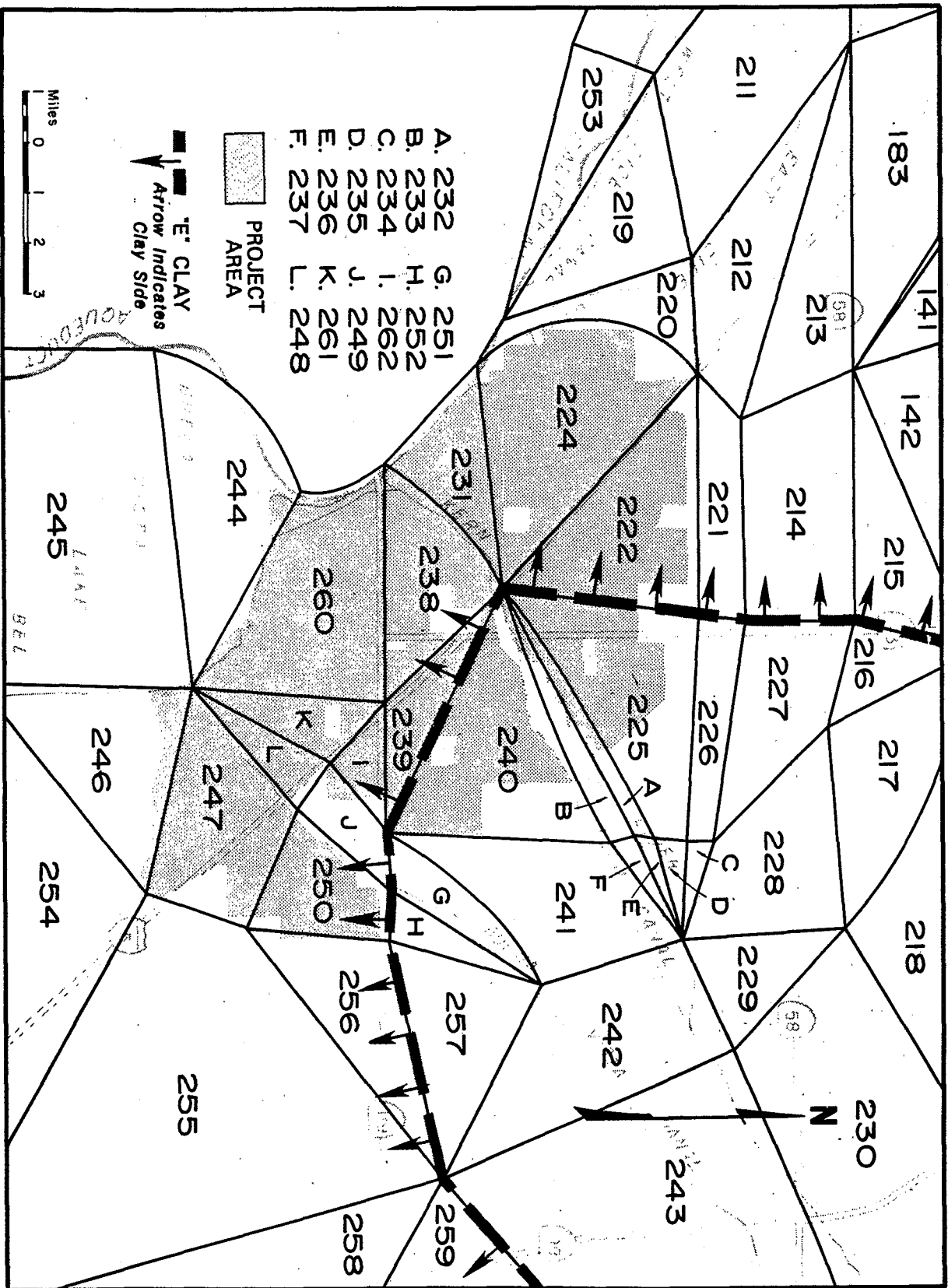


Figure 15. SWAM DAU'S IN KERN COUNTY

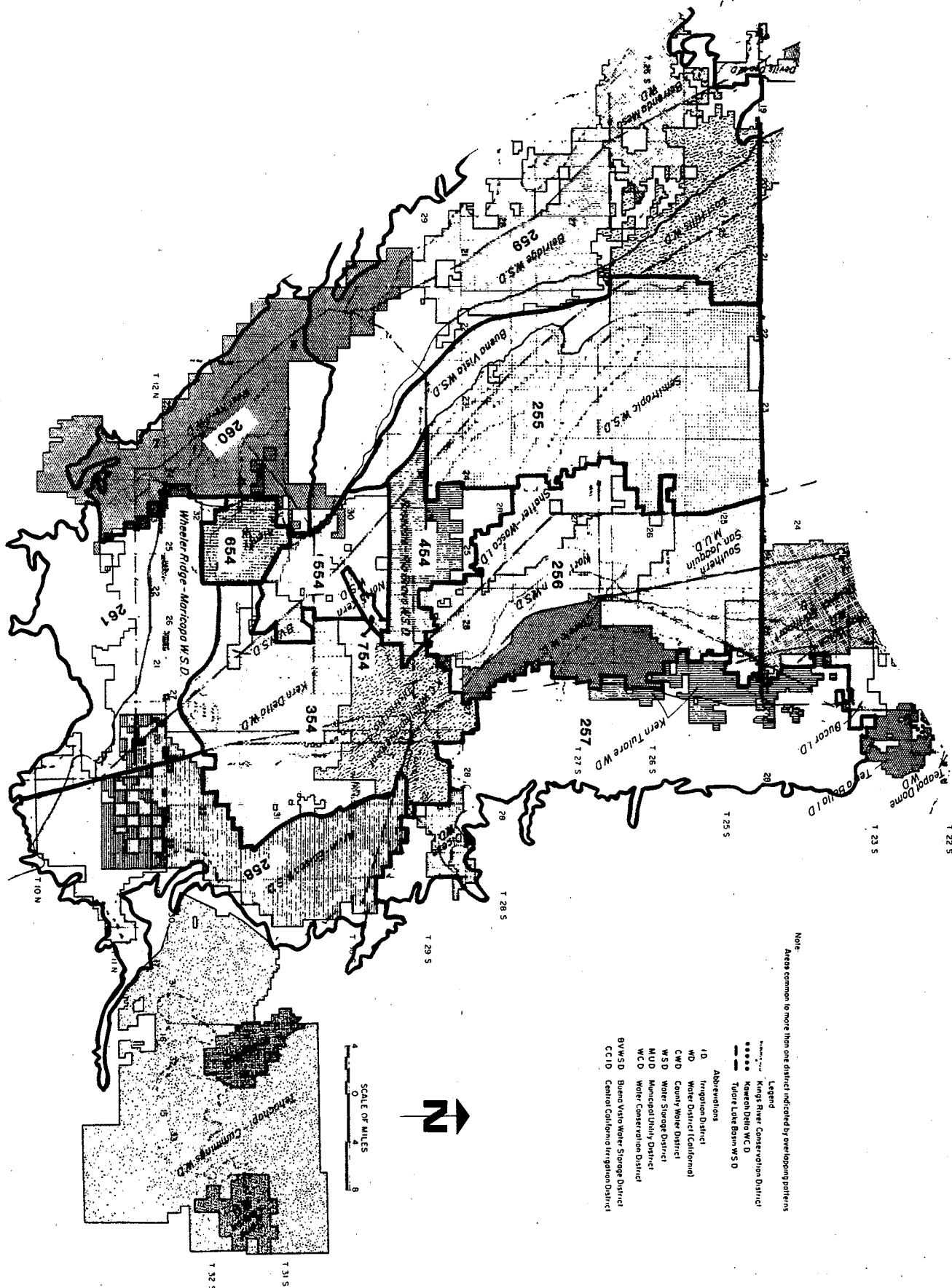
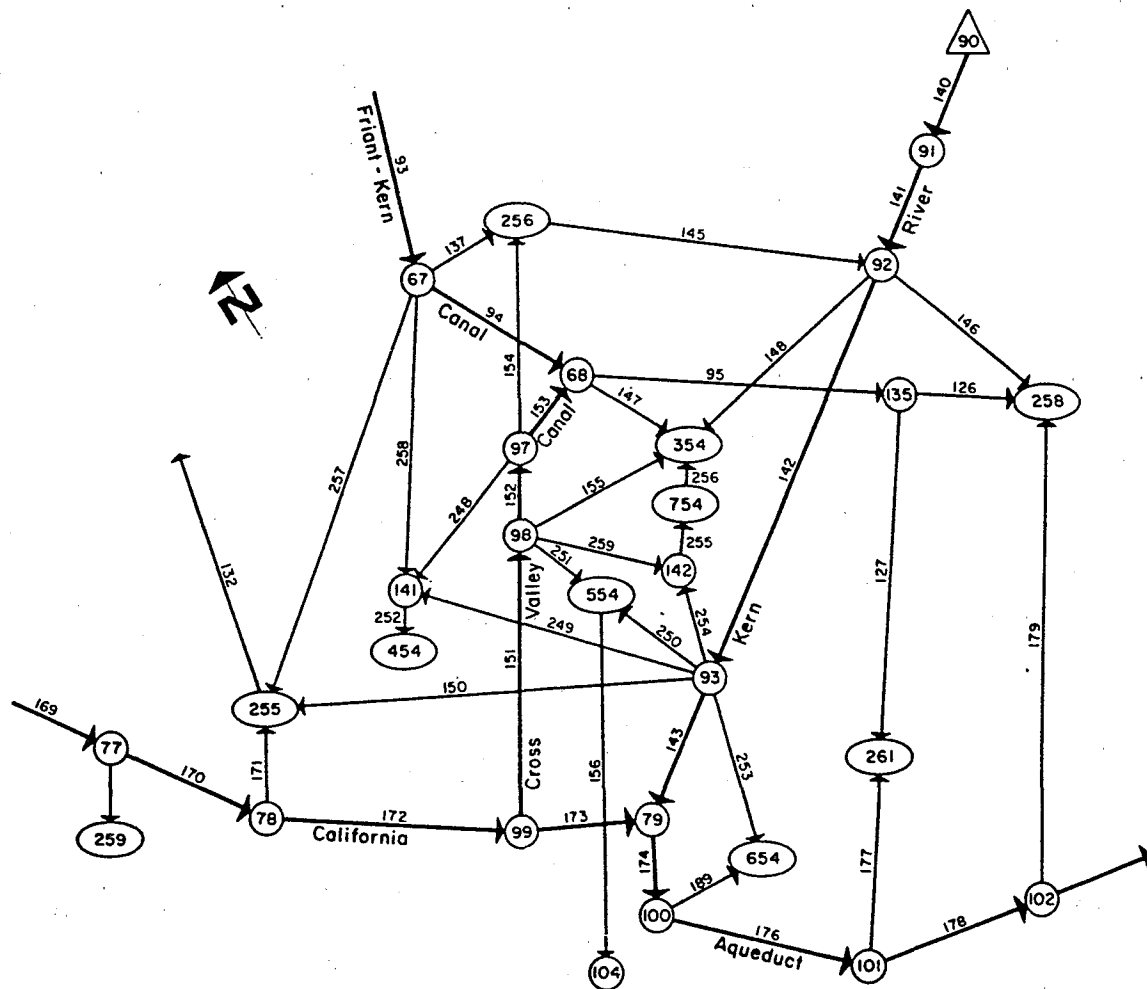


Figure 16
SWAM NETWORK IN THE KERN COUNTY BASIN
PORTION OF THE SAN JOAQUIN VALLEY



Annual precipitation during each of these periods was derived for DAUs, based on historical precipitation records for Bakersfield, Maricopa, and Wasco. Minor streamflow and intentional recharge were estimated in recent years, based on available records. Estimates of minor streamflow and intentional recharge were extended back in time before the availability of records by correlation with local precipitation. Estimates of municipal, industrial, and agricultural water use were increased in the future based on Scenario III estimates (Cal. DWR, 1985).

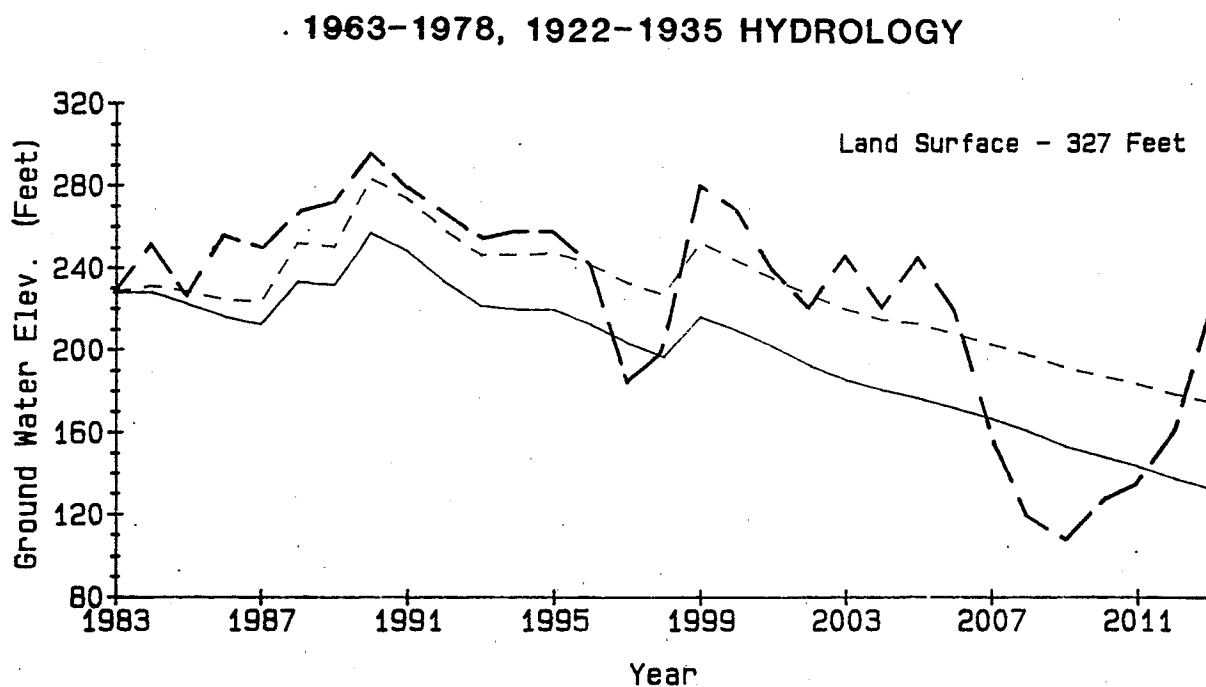
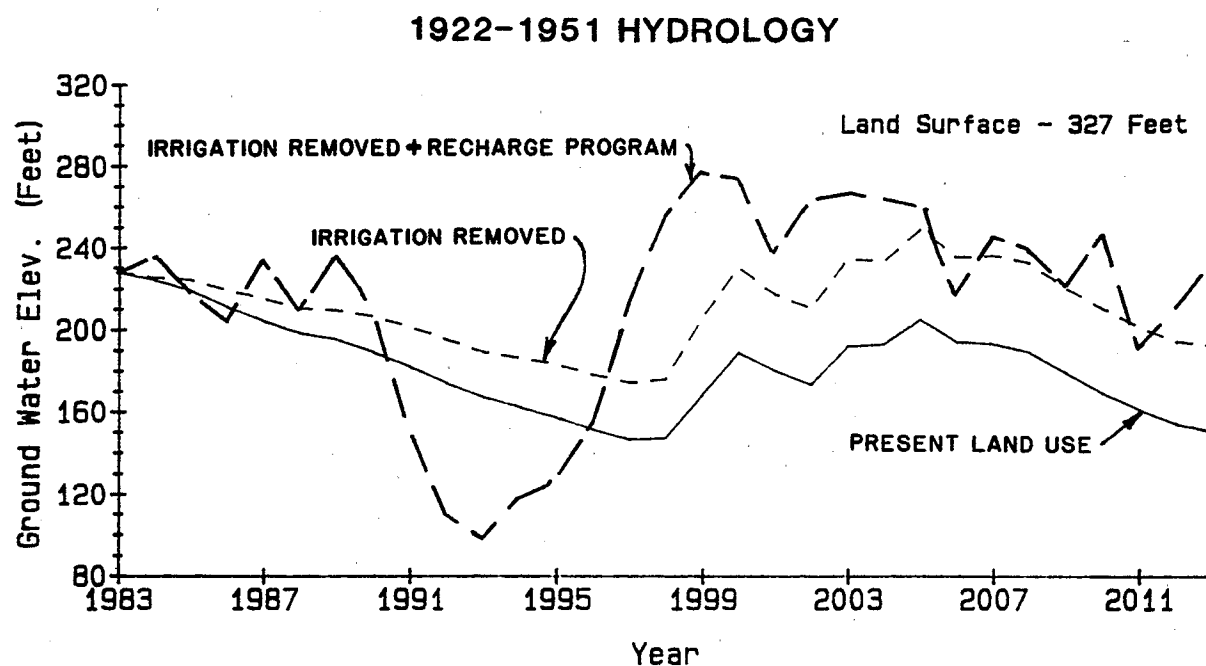
Kern River diversions and Friant-Kern Canal deliveries were estimated for the hydrologic periods, using the SWAM's diversion curves. These curves are relationships between upstream flow and the amount of diversion by an agency. On the Kern River, the diversion curves were estimated by comparing 1970-1984 diversion records with flow records for Kern River at First Point. Friant-Kern Canal diversion curves were based on Class I and II contractual amounts with some modifications to reflect historical deliveries of Class II water in wet years. Upstream flows used in the SWAM were taken from reservoir operations studies. For the Kern River, a DWR Kern River Intertie operations study was used to predict flows of the Kern River at First Point. Friant-Kern flows at Millerton were derived from a U. S. Bureau of Reclamation operations study of Friant Dam.

Ground Water Level Projections. The results of the GWM projections were semiannual projections of future ground water levels in Kern County. From these, hydrographs were developed of future water levels in typical areas in and adjacent to the project site. The first two hydrographs, displayed in Figure 17, show projected ground water levels in Element 225 (see Figure 14), located in the northern portion of the project site where the recharge and extraction program would be concentrated. The projected ground water levels fluctuate greatly in this element in response to the recharge and extraction program, but the water levels remain well below the ground surface. These projections reflect application of uniform recharge and extraction rates over the element. More detailed ground water simulations will be required later in the program when the actual basins are sited.

Figure 18 shows hydrographs of projected water levels in Element 232 located in the City of Bakersfield's 2,800-acre recharge site. Water levels for this element rise close to the land surface in both hydrologic periods, indicating the likelihood that water will interfere with local recharge. *Reduction in monthly recharge rates and coordination of recharge activities should avoid any adverse impact.* In the 1963 hydrologic series, water levels rise to within 12 feet of the land surface in projection year 1989, which corresponds to the historical 1969 wet year. In actual operation, ground water levels in and near the project area would be monitored, and SWP recharge efforts would be operated to ensure that ground water levels do not rise high enough to significantly interfere with local recharge efforts. The 1922 hydrologic series also has high ground water levels in some years, but the highest these levels rise is in 2004 when they reach 312 feet, about 19 feet below the surface. These water level increases could be mitigated by changing the distribution of SWP recharge within the project area.

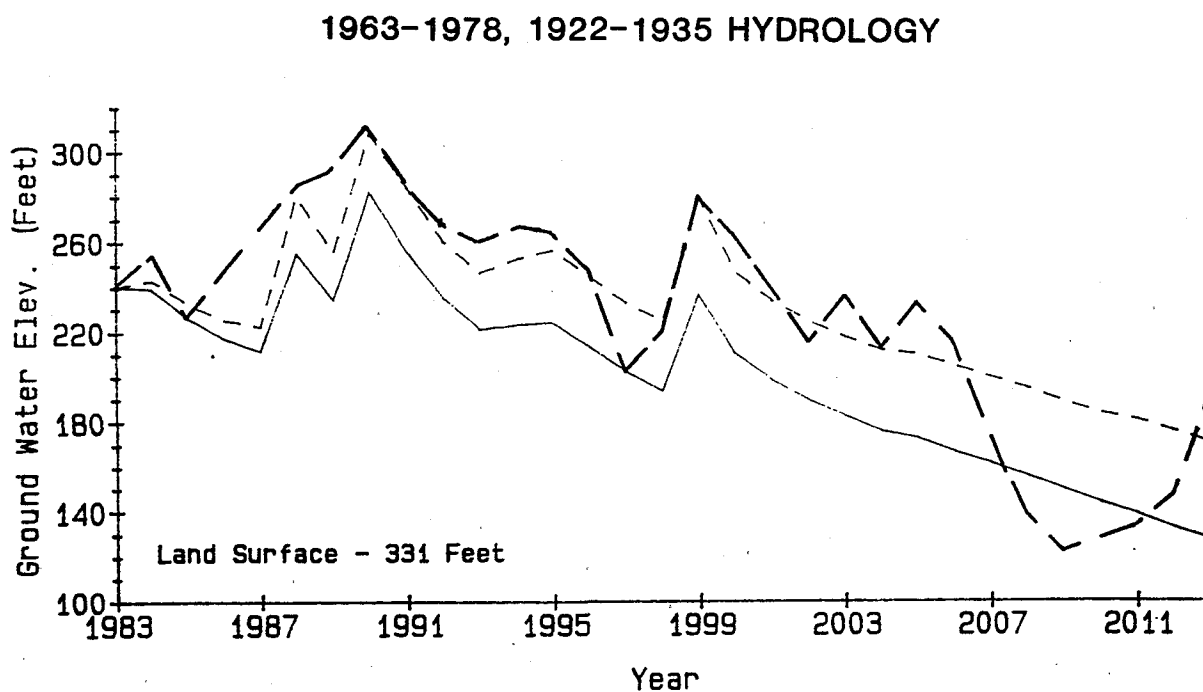
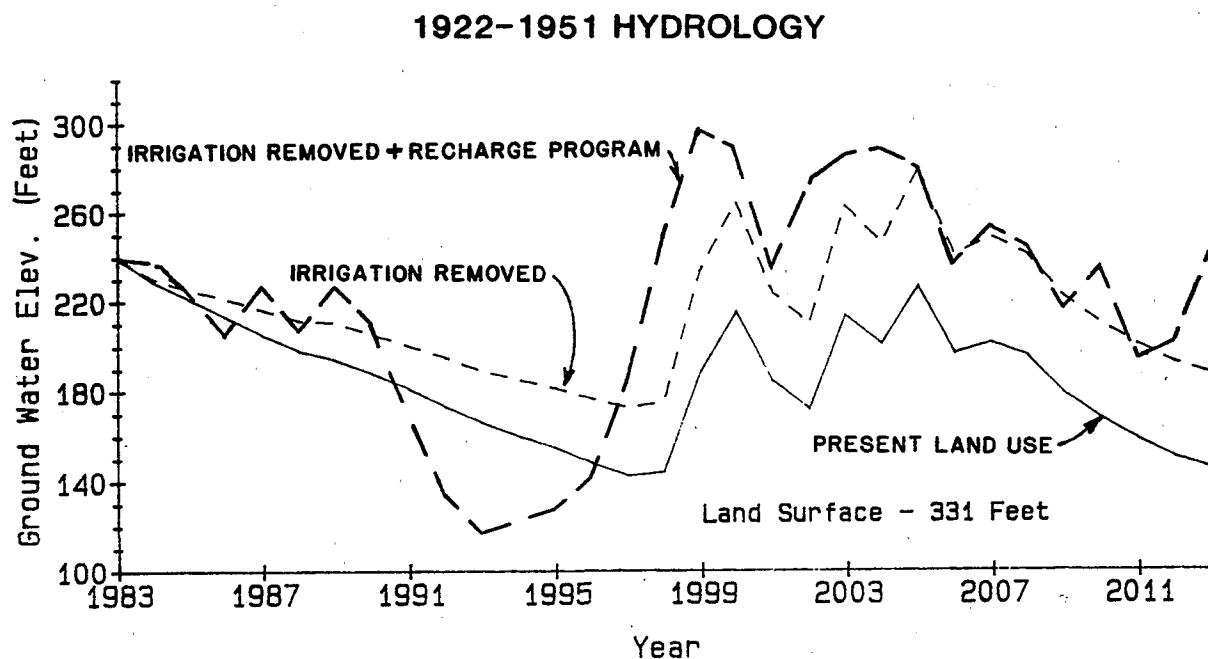
Projected ground water levels near Rosedale-Rio Bravo WSD's Goose Lake Slough recharge site are shown in the Element 221 hydrographs in Figure 19. Element 221 lies between Goose Lake Slough to the north and a part of the SWP recharge site to the south. Projected water levels in this element would peak at 298 feet in 1989 in the 1963 hydrograph series. This projection year corresponds with the historical 1969 wet year and represents the effects of large amounts of simultaneous recharge by the SWP and local agencies. As with the City of Bakersfield's 2,800-acre site in Element 232, actual operation of the SWP recharge site would be monitored and managed to minimize impacts of SWP recharge on Rosedale-Rio Bravo WSD's operations.

Figure 17. GWM PROJECTED WATER LEVELS IN ELEMENT 225



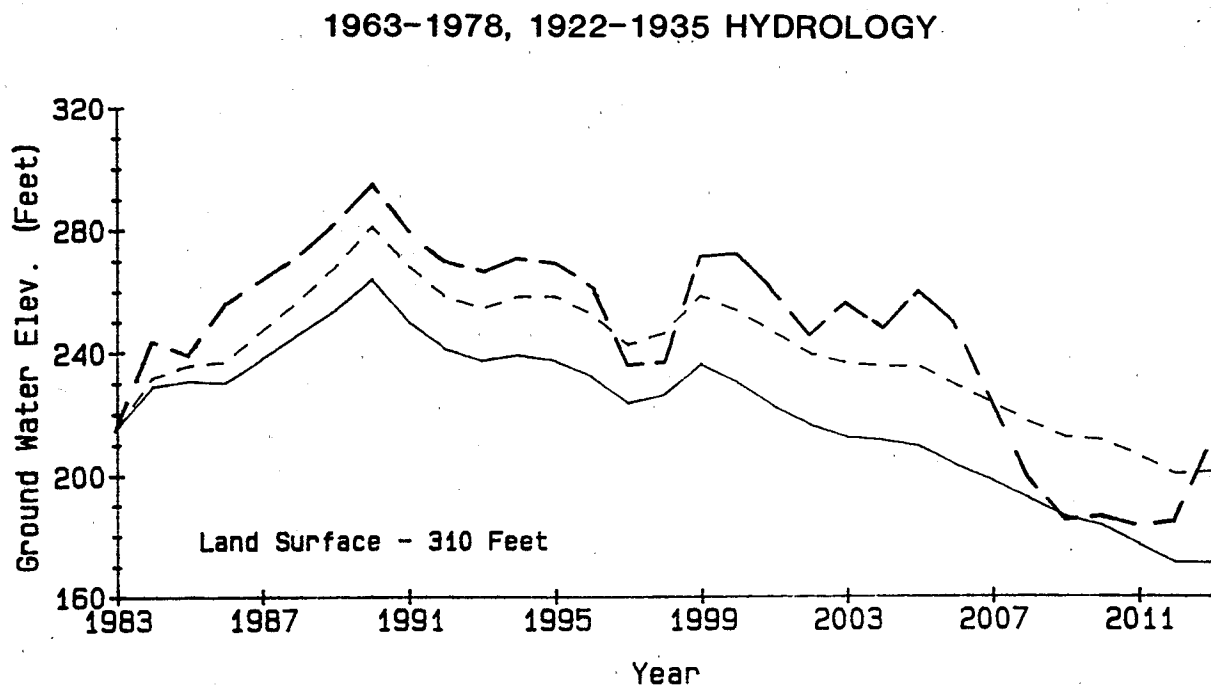
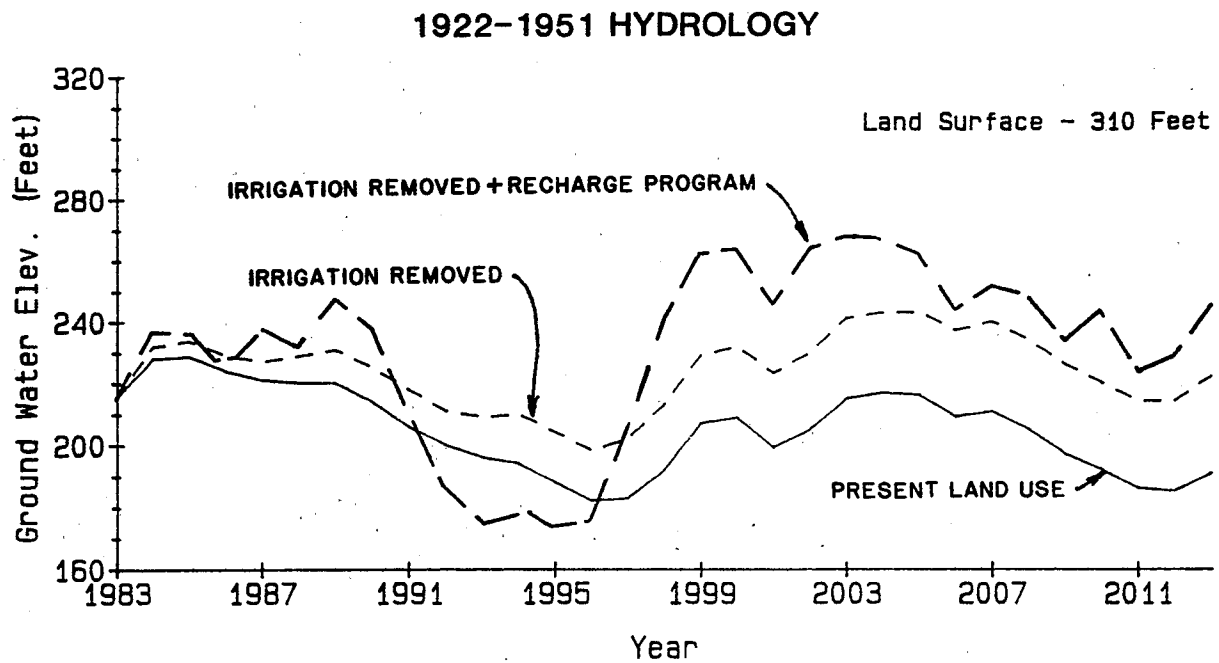
LOCATED IN THE NORTHERN PORTION OF THE PROJECT SITE

Figure 18. GWM PROJECTED WATER LEVELS IN ELEMENT 232



LOCATED IN THE CITY OF BAKERSFIELD'S RECHARGE SITE ALONG THE KERN RIVER.

Figure 19. GWM PROJECTED WATER LEVELS IN ELEMENT 221



LOCATED IN THE ROSEDALE-RIO BRAVO W.S.D.'s GOOSE LAKE SLOUGH RECHARGE SITE
NEAR THE NORTHERN BOUNDARY OF THE PROJECT

Projected ground water levels in Rosedale-Rio Bravo WSD and Kern Delta WD service areas are shown in Elements 214 and 241 hydrographs (Figures 20 and 21). Ground water levels in these elements are, in most cases, significantly higher with the SWP project. This increase in local ground water levels would result in reductions in energy use and related ground water pumping costs in these and adjacent areas. The most severe ground water level impacts in these areas occur in the years corresponding to the 1929-1935 critical period when local ground water levels fall rapidly in response to SWP extractions. During periods of maximum drawdown by the SWP, water levels would be only about 20 feet lower than they would be in the absence of the project. However, they would be higher overall, over the life of the project.

Mitigation. Project operation will, at times, result in greater ground water fluctuations than would occur in the absence of the project. A network of piezometers in conjunction with suitable production wells will be used to monitor water levels in the project area and adjacent lands. Monitoring also will be performed at any sensitive facility in the project area. Geotechnical investigations will be performed prior to project operation to provide minimum depths to ground water that will prevent buoyancy problems at sensitive facilities and eliminate the potential for soil liquefaction during earthquakes.

Project recharge operations will be conducted in such a manner that excessive water level rises should not occur. If data from the monitoring network indicate that excessive water level rises may occur, recharge activities will be modified or terminated as appropriate. Project facilities will be sited to spread any water level increases as evenly as possible over the project area, consistent with cost-effective recharge. It may be desirable to alleviate localized problems resulting from high water levels by pumping to draw down water levels in the local area. Project operations will be closely coordinated with the recharge activities of local agencies to assure that it will not interfere with their ability to recharge local water.

During critical dry periods when all or most of the SWP water in storage may be removed, water levels in some areas may decline below those that would occur in the absence of the project. Mitigation of this impact will result from the buffering effect of project lands. Further mitigation may be achieved by dispersing wells throughout the project area to minimize interference effects. It may be desirable to expand the surface water distribution systems in areas adjacent to the project so that pumping in those areas could be reduced during periods of maximum SWP pumping.

Vegetation

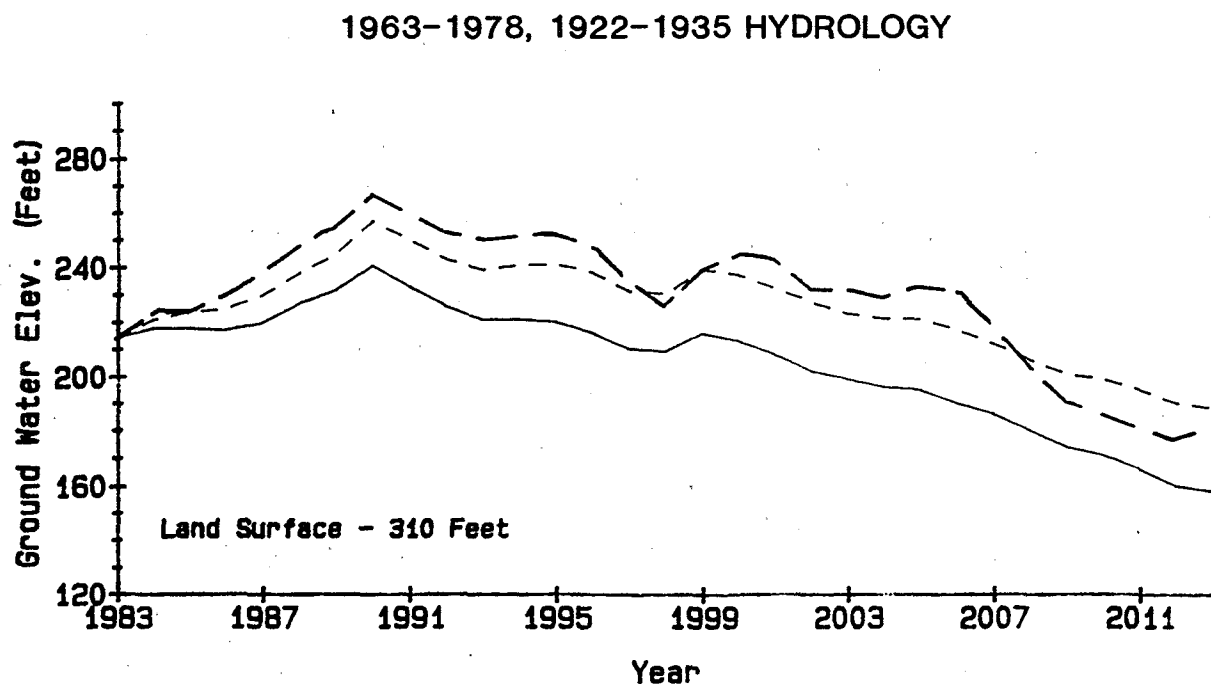
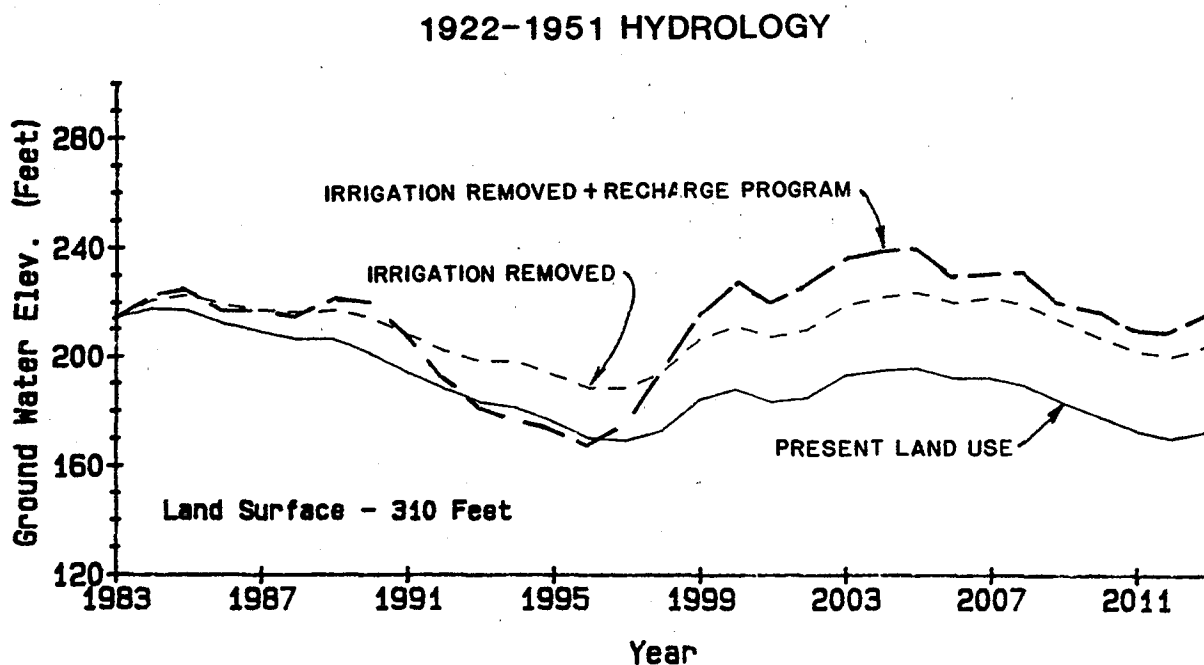
Construction of the ground water recharge basins is proposed to take place on lands that are currently used for agricultural production. No native vegetation would be affected.

One candidate plant species, *Cirsium crassicaule* (slough thistle), has been found near the Kern River, southeast of Tupman. Before any excavation and/or construction work took place in areas where sensitive vegetation may occur, a field survey would be conducted. This survey would be scheduled during the blooming season for the species.

The proposed project could enhance the native vegetation remaining in the area. The enhancement of vanishing communities of valley mesquite scrub, valley saltbush scrub, and valley sink scrub would benefit wildlife and help preserve these unique communities.

Those lands that are not used directly for recharge basins and appurtenant facilities would be allowed to revert to natural conditions. To encourage native reversion, some disturbed areas may be reseeded with vegetation compatible with wildlife and the adjacent agricultural activity. Species such as *Atriplex* are preferred for wildlife but discouraged in some agricultural areas due to their

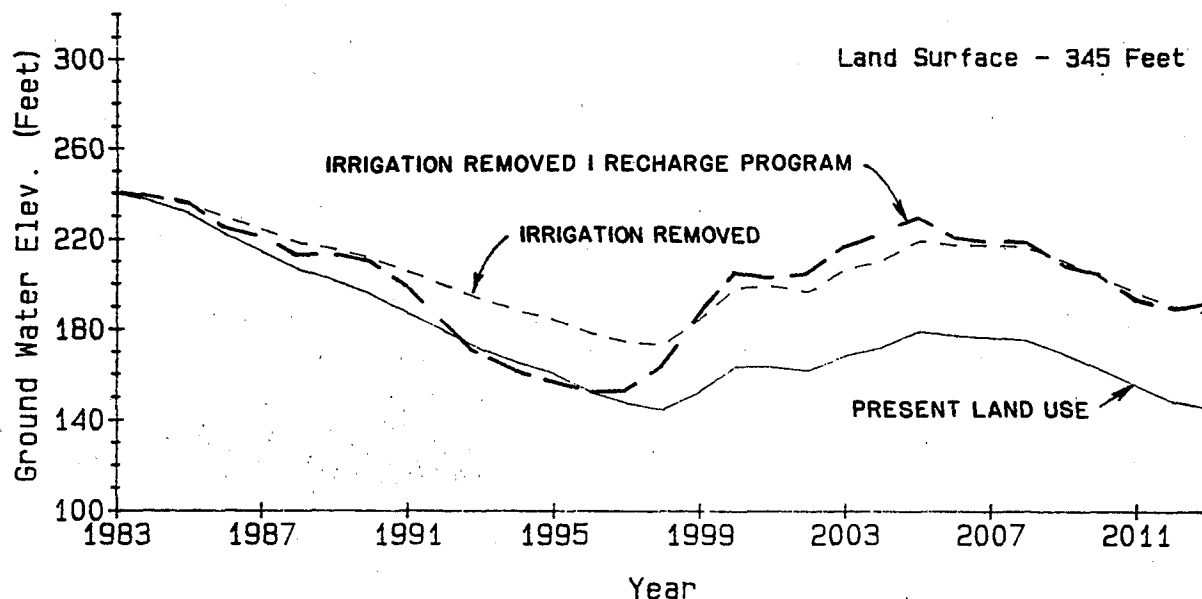
Figure 20. GWM PROJECTED WATER LEVELS IN ELEMENT 214



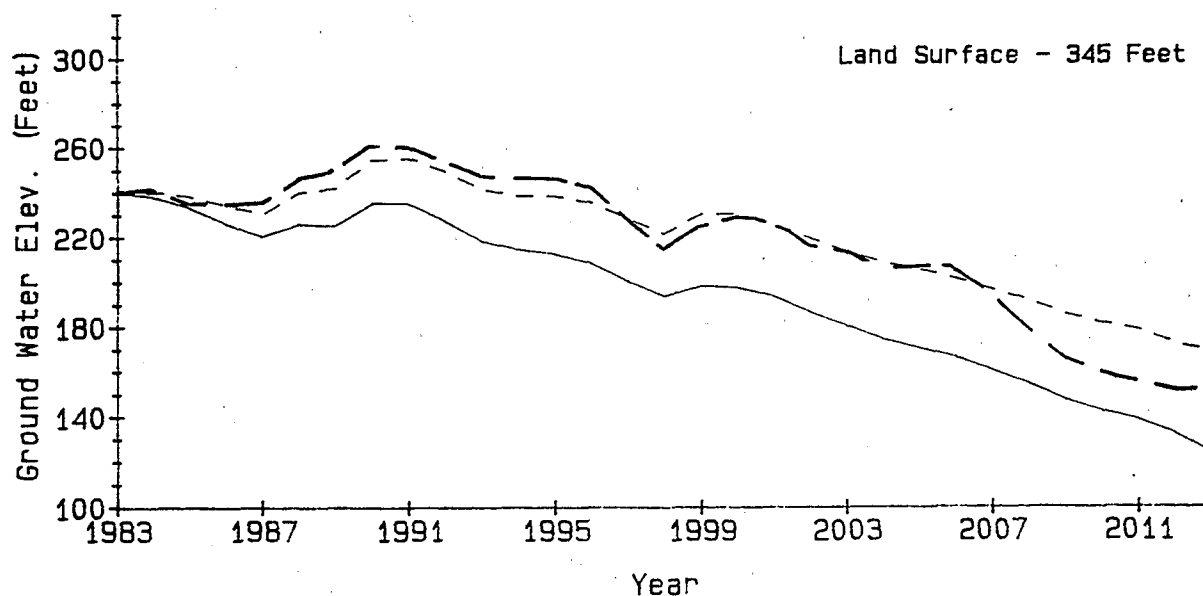
LOCATED IN THE ROSEDALE-RIO BRAVO W.S.D. SERVICE AREA NORTH OF THE PROJECT SITE

Figure 21. GWM PROJECTED WATER LEVELS IN ELEMENT 241

1922-1951 HYDROLOGY



1963-1978, 1922-1935 HYDROLOGY



LOCATED IN THE KERN DELTA W.D. SERVICE AREA EAST OF THE PROJECT SITE.

association with pest species (e.g., beet leaf hopper). Attempts will be made to accommodate wildlife needs without impacting agricultural production in adjacent areas.

No adverse environmental impacts are anticipated as a result of the proposed action.

Fish

The proposed project is expected to have a less than significant effect on fishery resources. The mosquitofish that would be planted in the percolation ponds to control mosquitoes may be adversely affected if they become entrapped when the ponds are drained for reconditioning.

Another concern that could have a significant adverse effect is the possibility that white bass could be found within the transport system of the recharge basins. This species is highly aggressive and could compete with the more desirable Sacramento-San Joaquin Delta salmon-steelhead fishery if they are allowed to migrate northward.

Mitigation. To avoid restocking mosquitofish when a basin is reconditioned, these fish would be permitted to flow into adjoining ponds as the ponds are drained. This method would avoid the need to restock the costly fish each time the basins are drained for maintenance.

Periodic sampling of the conveyance system to ascertain the presence or absence of white bass is recommended. If white bass are discovered, the Department of Water Resources would cooperate fully with the Department of Fish and Game in instituting control measures (e.g., screening and chemical eradication) to ensure that the fish cannot migrate north toward the Sacramento-San Joaquin Delta.

Wildlife

The flooding of percolation basins described in the proposed project could affect waterfowl and water birds by providing ideal conditions for the production of avian botulism (*Clostridium botulinum*). While not toxic to humans, the disease is very toxic to waterbirds and often results in disastrous die-offs of waterfowl. The following conditions are conducive to botulism production: (1) dead vegetative or organic matter, (2) alkaline environment, (3) shallow or stagnant water, and (4) relatively high temperatures. The disease is usually apparent when temperatures start to rise. If not controlled, the disease spreads quickly and lasts through the winter months.

The proposed percolation basins will be attractive resting areas for migratory waterfowl and other birds. Normally this is not a problem. However, the basins could prove to be ideal "rafting" areas for birds that normally utilize the Kern Wildlife Refuge or any of the several private duck clubs in the vicinity of the project. Rafting refers to the use of ponded areas that are inaccessible to hunters.

Several threatened, endangered, and candidate wildlife species, including the San Joaquin kit fox, blunt-nosed leopard lizard, giant kangaroo rat, and San Joaquin antelope squirrel, are known to inhabit some areas on the project site. It is not likely that these species would be affected by activities related to the construction of the percolation basins because these basins will be located on lands presently in agricultural production.

The potential exists to enhance current wildlife populations. Waterfowl habitat could be created in several areas where permeability rates are conducive to ponding water for long periods of time. Threatened and endangered wildlife species such as the San Joaquin kit fox and the blunt-nosed leopard lizard would benefit from the project as well. Many other wildlife species also will utilize

these habitats as the areas revert to natural conditions. Selective planting of native vegetation would further enhance the wildlife populations in the area. Other wildlife species that could benefit include California quail, chukar partridge, and Audubon cottontail.

Mitigation. To mitigate the potential impact of an outbreak of botulism, the Department of Water Resources would consult with the Department of Fish and Game on methods of construction, operation, and maintenance of the percolation basins to prevent or minimize the disease. These methods could include constructing deep ponds (20 inches or more, when possible) that could be dewatered rapidly. The basins also could be monitored for sick or dying waterfowl during periods when avian botulism is anticipated.

Rafting could be eliminated by allowing controlled hunting access to the percolation ponds during hunting season. The Department of Water Resources would encourage this compatible use if the Department of Fish and Game would agree to manage, operate, and maintain the areas as needed for waterfowl hunting.

A field survey by qualified biologists would be performed to ensure the absence of threatened and endangered species in the areas proposed for percolation basins. If any critical species are located, the Department of Fish and Game would be consulted to either relocate the basins or minimize the possible adverse impacts. The Department of Water Resources will cooperate with the Department of Fish and Game to incorporate methods to reclaim areas suitable for wildlife.

Oil and Mineral Resources

Mineral rights will be retained by Tenneco West Incorporated. Implementation of the proposed project could impact access and operation of existing and future oil and mineral resources. The placement of future oil and gas wells could impact the potential to enhance the area for some wildlife.

Mitigation. The Department of Water Resources could request that Tenneco identify those lands having the greatest oil and mineral potential. *Mitigation for these areas will be specified in the deed restrictions.* These areas will also be avoided to the extent possible in locating project facilities and enhancing wildlife. Impacts on access and operation by Tenneco West Incorporated could be minimized by constructing levees to prevent interference.

Recreation

The proposed project is not expected to affect existing recreational facilities or activities. Recreational opportunities related to bird watching and waterfowl hunting may be enhanced.

Lands within the project boundaries that are unsuited for percolation basins (i.e., lands with low permeabilities) could be managed by the Department of Fish and Game for wildlife use. These lands could be converted to ponds more suitable and attractive to migratory waterfowl and waterbirds for resting and nesting. The Department of Water Resources would encourage this use of the area, providing the Department of Fish and Game and/or private duck clubs supply the operation and maintenance of the facilities. The potential development of additional recreational opportunities will be discussed in greater detail when actual sites are chosen for the recharge basins.

Mitigation. No mitigation is required.

Cultural Resources

The area is known to be rich in archeological evidence. An archeological records search conducted in April 1986 indicated that 18 sites occur within the project boundaries. The sensitivity of

the area to known cultural resources is considered to be high. Construction of the proposed facilities and associated levees and roads could adversely impact cultural resources if these are encountered during excavation.

Mitigation. The Department of Water Resources would contract for field surveys of all areas being considered for ground water recharge basins. If, during construction, evidence such as beads, chert, obsidian, or bone fragments are unearthed, a qualified archeologist will be contacted to determine the significance of any find before construction continues.

General Economic and Financial Effects

The project would have economic impacts through increased SWP yield and through changes in local agricultural production. It also will affect the local area financially.

Economic Benefits to SWP Contractors

The proposed project could increase *firm yield about 160,000* acre-feet per year. The economic benefit of this water is about \$150 per acre-foot, based upon the alternative cost of average yield from Los Banos Grandes. Total annual economic benefits to the SWP contractors would amount to about \$24 million per year. After deducting the annual costs of the proposed project (about \$13 million per year), the net economic benefit is about \$11 million per year.

In terms of financial costs paid by the contractors, the proposed project would cost about \$81 per acre-foot for a firm annual yield of *160,000* acre-feet. In comparison, the financial cost of Los Banos Grandes is about \$150 per acre-foot for the same average annual yield.

Local Pumping Cost Benefits

The project would remove from production about 29,000 acres of land that are primarily irrigated with ground water. This will result in a net water savings of up to 70,000 acre-feet. Current ground water pumping costs on the property are about \$30 per acre-foot. Applying this unit value to the maximum savings of 70,000 acre-feet results in an economic benefit of water saved of about \$2.1 million. If it is assumed that no new lands are placed in production and that all the saved water is used for overdraft reduction, then the value of the overdraft reduction is about \$2.1 million. If a significant amount of the water savings is used to irrigate new crops elsewhere, then the value of the overdraft reduction would be less. However, this increase in production would lower production losses (income and employment) associated with the project. These production losses are discussed further in this chapter. Operation of the project will result in a net increase in energy use in the local area.

Local Wildlife Habitat Benefits

Another impact of the land purchase will be to allow acreages that are currently in agricultural production to revert to native vegetation and/or to develop wetland habitat. Such uses would be beneficial to the local ecosystem. While such a land use change *has some* economic value, no attempt has been made to quantify it in this report.

Income and Employment Impacts of Changes in Local Land Use

Table 8 shows a marked increase in irrigated acres on the project site. However, given the current financial problems facing agriculture in the San Joaquin Valley (and nationwide), crop acreages on the Tenneco West Incorporated site are not expected to expand significantly in the near future.

TABLE 8. CHANGE IN NONIRRIGATED AND IRRIGATED LANDS (acres)

	1969	1977	1984
Nonirrigated Land	38,570	21,950	16,790
Irrigated Land	6,230	22,850	28,010
	-----	-----	-----
Total	44,800	44,800	44,800
Percent Nonirrigated	86	49	37

The proposal would remove land from agricultural production, with accompanying effects upon income and employment. Table 9 presents the agricultural acreages (based on the 1984 cropping patterns) that would be removed as a result of the proposal. The first column shows about 28,500 acres would be removed from production. The primary crop affected is cotton. Assuming no additional increases in agricultural acreage, the maximum impact of foregone agricultural production should be limited to the effects shown in Table 9.

Table 9 also presents the sales gross receipts (or gross income) obtained from the 1984 crop acreages. These receipts (escalated to 1985 dollars) are determined by multiplying average yields times average prices over the five year period, 1978-1982. After deducting intermediate farm expenses (such as seed, fertilizer, energy, etc.), primary income, as shown in column 3 of the table, is obtained. This income includes return to farm ownership (about 14 percent of total income), management income (a 40 percent share of total income), and labor income (a 46 percent share of total income). The full land purchase would result in a primary income loss of about \$6.4 million per year. A primary income loss in a region will have a ripple effect in the region and throughout the State's economy. Secondary effects caused by acreage reductions will result from reduced purchases of agriculture-related products, services, and wages. Statewide, the sum of primary and secondary income lost as a result of the land purchase is about \$16.5 million. Approximately 70 percent of the statewide secondary impacts would be expected to occur in the local area.

The primary employment impact for the proposed action is about 186 *person years*. The sum of primary and secondary employment is about 777 *person years* (Table 9).

Mitigation. Income and employment losses would be reduced if the State leased some acres for nonirrigated crops such as wheat or barley. It is not known how many acres (if any) could be leased. If, for example, 5,000 acres were leased for nonirrigated production, the direct income loss would be reduced from \$6.0 million to \$5.6 million.

Most of the income impact results from wages lost by displaced farm managers and workers. To the extent that these managers and workers can locate employment elsewhere in the region, the loss of income to the region would be reduced. The overall employment impact also will be partially mitigated by the new employment that is required to operate the recharge project. However, the jobs created with the project are not expected to draw displaced farm employees.

As previously described, about 14 percent of the income impacts are in the form of return to the land owner, Tenneco West Incorporated. Tenneco West Incorporated will be compensated for this income loss through the purchase price.

TABLE 9
AGRICULTURAL IMPACTS OF THE PROPOSED ACTION

Crop	1984 Acreage	Gross Receipts ^{1/} (Thous. \$1985)	Income (Thous. \$1985)		Employment (Person-Years)	
			Primary	Secondary ^{2/}	Primary	Primary and Secondary ^{3/}
Grain	3,346	\$ 702.7	\$ 288.1	\$ 812.4	9.8	34.7
Field						
Cotton	13,553	9,593.3	2,878.0	11,828.6	115.1	606.6
Dry Beans	741	396.1	206.0	517.1	6.3	25.1
Sorghum	375	81.9	33.6	93.1	1.1	3.7
Sugar Beets	558	383.0	237.5	508.3	5.7	18.5
Subtotal	15,227	10,454.3	3,355.1	12,947.1	128.2	653.9
Pasture						
Alfalfa	9,161	5,287.7	2,114.8	6,027.2	52.9	228.0
Truck						
Carrots	237	646.3	355.5	846.1	27.8	57.8
Melons	14	30.3	16.7	39.7	1.3	2.7
Subtotal	251	676.6	372.2	885.8	29.1	60.5
Double-Cropped						
Grain-Corn	110	59.7	24.5	67.6	0.9	2.8
Grain-Sorghum	148	63.7	26.1	72.8	0.9	2.9
Grain-Carrots	61	178.7	96.5	231.6	7.3	15.4
Grain Alfalfa	71	56.1	22.4	63.8	0.6	2.5
Sugar Beets-Corn	131	133.9	73.6	167.8	2.0	6.4
Subtotal	521	492.1	243.1	603.6	11.7	30.0
Total Cropped	28,506	17,613.4	6,373.3	21,276.1	231.7	1,007.1
Fallow	1,428	0	0	0	0	0
Idle	1,824	0	0	0	0	0
Total Agricultural	31,758	\$17,613.4	\$6,373.3	\$21,276.1	231.7	1,007.1

^{1/} Gross receipts from sales based upon 1978-1982 base period yields and prices. Base period prices have been inflated to 1985 dollars.

^{2/} Income secondary impacts estimated using Table 15, Bulletin 210, Measuring Economic Impacts: The Application of Input-Output Analysis to California Water Resources Problems (March 1980).

^{3/} Employment secondary impacts estimated using Table 16, Bulletin 210.

Property Tax

In addition to the income and employment losses due to the removal of agricultural lands from production, Kern County will experience a revenue loss because the land will be placed in State ownership. All the agricultural acreage within the project boundary is under the protection of the Williamson Act. As a result, with the full purchase proposal, county property tax losses would be about \$200,000.

Mitigation. If the State leased all or portions of the land for other uses, Kern County would collect a possessory interest tax from the tenants. This tax is estimated to be \$160,000 per year, assuming all the agricultural lands (29,690 acres) are leased.

Chapter 5. SIGNIFICANT EFFECTS OF THE PROPOSED PROJECT AND MITIGATION MEASURES

The significant adverse environmental effects of the proposed action and the mitigation measures needed to reduce these impacts to a less than significant level are identified in the following table.

Table 10. Significant Effects and Mitigation Measures

Impact Category	Impact	Mitigation
Fish	Potential for white bass to compete with the more desirable Delta fishery if bass are introduced into the conveyance canal and migrate northward.	Periodically sample the conveyance system. If white bass are found, institute control measures to prevent fish from migrating toward the Delta.
Waterfowl Rafting	Economic effects on adjacent duck clubs and refuges as a result of rafting; and a reduction in recreational opportunities on surrounding areas.	Allow controlled hunting in the project area so that these areas become less attractive for rafting.
Avian Botulism	Increase conditions conducive to the production of avian botulism.	Consult with DFG regarding construction methods to minimize conditions favorable for botulism outbreaks. Monitor ponds during periods when the potential for botulism is greatest.
Vectors	Potential increase in mosquito populations could result in nuisance problems and increase the risk of contracting diseases, such as encephalitis and malaria, carried by mosquitoes.	Contract with local mosquito abatement district to provide adult and larvae mosquito monitoring, mosquitofish planting, and eradication of larvae and/or adults. Incorporate measures to minimize stagnant water conditions.
Ground Water Levels	Reduction in the storage capacity of the Rosedale-Rio Bravo WSD and City of Bakersfield recharge programs caused by mounding under the project area. Projected operation will result in greater fluctuations than would otherwise occur. During periods of maximum draw-down by the State Water Project, local water levels would be about 20 feet lower than in the absence of the project.	Monitor ground water levels under the project site and reduce recharge if excessive mounding occurs. Expand surface distribution systems to reduce local pumping during periods of heavy extractions. Piezometers and production wells will be used to monitor water levels in the project area and adjacent lands. Surface distribution systems could be expanded to lessen the need for local pumping during periods of heavy extractions. If data indicate that excessive

Table 10. Significant Effects and Mitigation Measures (continued)

Impact Category	Impact	Mitigation
Ground Water Levels (continued)		water level rises may occur, recharge activities will be modified as appropriate.
Cultural Resources	Excavation during construction could impact cultural resources within the project area.	Field survey areas being considered for ground water recharge; contract a qualified archeologist to determine the significance of any find unearthed during construction.

Chapter 6. SIGNIFICANT EFFECTS THAT COULD NOT BE AVOIDED

The implementation of the plan as presented in the proposed action would have some unavoidable adverse environmental effects. These effects will include:

- Increased noise levels due to construction activities.
- Potential service disruptions if oil and gas pipelines or electrical or telephone transmission lines are severed during construction. To prevent this disruption, DWR contract specifications will require the contractor to locate and protect existing utilities.
- Net energy use increase.
- Potential disruption of sensitive archeological areas during construction.

The appropriate mitigation or compensation measures required to minimize these effects will be implemented where feasible to do so.

Chapter 7. ALTERNATIVES TO THE PROPOSED ACTION

Alternative 1. North of Taft Highway Recharge Project

This alternative involves acquiring about 30,000 acres of land north of Taft Highway for use in the recharge program. This land includes sufficient area for the 3,500 acres of percolation basins, as well as appropriate conveyance and extraction facilities. Project facilities required for this alternative would be the same as those described for the proposed action. Construction and operation impacts *would also* be the same. Average annual SWP deliveries would increase by up to 225,000 acre-feet per year, as for the proposed action. A unit value of \$85 per acre-foot was used to estimate the economic value of the increased SWP average annual deliveries. Applying this unit value toward the entire average annual deliveries results in an economic benefit of about \$19 million per year.

For this alternative, agricultural related acreages total about 20,300 acres with about 18,700 acres currently in production, as shown in Table 11. Irrigated agriculture south of Taft Highway would not be affected by this alternative. The economic impacts of removing the acreages shown in Table 11 from production will result in the losses of income and employment as shown. The loss of income and employment could be mitigated to some extent with nonirrigated agricultural leases between the State and growers.

The overdraft correction benefits of removing this acreage from production would be up to 50,000 acre-feet per year. Applying a unit value of \$30 per acre-foot (based upon the cost of ground water pumping) to the value of the reduction in overdraft, the economic value with a 50,000 acre-foot pumping reduction is about \$1.5 million per year. In addition, the buffer zone would be reduced and SWP ground water storage operations would likely have a larger impact on adjacent ground water users. Adjacent users could experience greater ground water level declines in extraction years and water levels could rise higher in recharge years.

Kern County will experience a property tax revenue loss because the land will be placed in State ownership. This impact would be less than that described in the proposed action. With this alternative, county property tax losses would be about \$131,000.

Another impact of the land purchase will be to allow acreages that are currently in agricultural production to revert to native vegetation and/or to develop as wetland habitat. Such uses would have a beneficial effect upon vegetation and wildlife. While such a land use change possesses economic value, no attempt was made to quantify it in this report.

Wildlife impacts would be similar to those described in the proposed action, except that they would apply to a smaller area. Native vegetation would still be reintroduced into the area. While a smaller area would be available for wildlife habitat enhancement, sensitive species such as the blunt-nosed leopard lizard and the San Joaquin kit fox will benefit. The benefits to waterfowl would be the same as for the proposed project.

Alternative 2. 3,500-Acre Recharge Project

Alternative 2 involves purchasing the land needed for the recharge facilities and acquiring easements on lands needed for the other project facilities. Under this alternative, project facilities similar to those described in the proposed project would be built. The 3,500 acres needed for recharge facilities would be purchased, as well as easements obtained to construct necessary conveyance facilities. The SWP average annual water supply increase would probably be smaller.

TABLE 11
AGRICULTURAL IMPACTS OF ALTERNATIVE 1

Crop	1984 Acreage	Gross Receipts ^{1/} (Thous. \$1985)	Income (Thous. \$1985)		Employment (Person-Years)	
			Primary	Secondary ^{2/}	Primary	Primary and Secondary ^{3/}
Grain	970	\$ 203.7	\$ 83.5	\$ 235.5	2.9	10.3
Field						
Cotton	9,260	6,554.6	1,966.4	8,081.9	78.7	414.7
Dry Beans	700	374.2	194.6	488.4	6.0	23.9
Sorghum	700	152.9	62.7	173.7	2.1	7.0
Sugar Beets	840	576.6	357.5	765.1	8.6	28.0
Subtotal	11,500	7,658.3	2,581.2	9,509.1	95.4	473.6
Pasture						
Alfalfa	5,440	3,140.0	1,256.0	3,579.6	31.4	135.3
Truck						
Carrots	237	646.3	355.5	846.1	27.8	57.8
Melons	14	30.3	16.7	39.7	1.3	2.7
Subtotal	251	676.6	372.2	885.8	29.1	60.5
Double-Cropped						
Grain-Corn	110	59.7	24.5	67.6	0.9	2.8
Grain-Sorghum	148	63.7	26.1	72.8	0.9	2.9
Grain-Carrots	61	178.7	96.5	231.6	7.3	15.4
Grain-Alfalfa	71	56.1	22.4	63.8	0.6	2.5
Sugar Beets-Corn	131	133.9	73.6	167.8	2.0	6.4
Subtotal	521	492.1	243.1	603.6	11.7	30.0
Total Cropped	18,682	12,170.7	4,536.0	14,813.6	170.5	709.7
Fallow	1,060	0	0	0	0	0
Idle	575	0	0	0	0	0
Total Agricultural	20,317	\$ 12,170.7	\$ 4,536.0	\$ 14,813.6	170.5	709.7

- 1/ Gross receipts from sales based upon 1978-1982 base period yields and prices. Base period prices have been inflated to 1985 dollars.
- 2/ Income secondary impacts estimated using Table 15, Bulletin 210, Measuring Economic Impacts: The Application of Input-Output Analysis to California Water Resources Problems (March 1980).
- 3/ Employment secondary impacts estimated using Table 16, Bulletin 210.

Most of the extraction facilities would be located outside the 3,500-acre site to avoid well interference. Arrangements would be made with neighboring landowners to either lease or purchase these well sites. The 3,500 acres required for spreading would be in relatively dispersed, smaller blocks which greatly reduce the desirability of this option.

Irrigated agriculture would be expected to continue in its current state in areas outside the 3,500-acre recharge site. Although the 3,500 acres would be taken from lands currently in agricultural production, their specific site has not been determined; thus the displaced acreages are not known. For the purpose of this analysis, it was assumed that the distribution of crops displaced is similar to the overall crop distribution in the entire study area and, therefore, the impacts would be proportionate (about 13 percent) to the impacts described in the previous alternatives. Under this assumption, total statewide income impacts (primary and secondary) would be about \$2.6 million. Approximately 70 percent of the statewide secondary impacts are expected to occur in the local area. The water supply for this area would continue to be primarily ground water. There would be minimal overdraft reduction with this alternative. Area ground water levels would continue to decline in the future under normal hydrologic conditions. Energy use and costs for ground water pumping would rise, and the potential that poorer quality westside ground water would migrate into the area would increase.

Since most of the existing agricultural land would remain in private use, the loss of tax revenue would be about \$15,000.

No additional areas would be available for terrestrial wildlife enhancement. However, additional waterfowl habitat would be provided in the recharge areas in wet years. *The owners of the property wish to sell the property, and easements are not available. Lack of control over land use and failure to reduce local extraction may make the project unacceptable to local interests. Purchase of strips of land for access and well sites would cause severance damage.*

Alternative 3. KCWA Ownership of the Project Site

Alternative 3 would involve KCWA purchasing the project site for a SWP ground water storage project. With this alternative, KCWA would either purchase the project site directly from Tenneco or acquire it at a later date from the Department of Water Resources. The project operations would be integrated into the total SWP operations just as with the proposed action.

Project impacts under this alternative would be the same as described for the proposed action.

Alternative 4. Los Banos Grandes Reservoir

An offstream storage alternative to the proposed SWP recharge program is the construction and operation of Los Banos Grandes Reservoir. Los Banos Grandes is an alternative only in the sense that a choice is available *regarding the timing of additional SWP facilities*. Both Los Banos Grandes and ground water storage are needed to develop a water supply to meet contractor entitlements in the future.

With this alternative, a reservoir with a storage capacity up to 1,500,000 acre-feet would be constructed on Los Banos Creek near the California Aqueduct and the San Luis Reservoir. Los Banos Grandes would store excess water pumped south from the Delta through the California Aqueduct, primarily during the wet winter months. The storage would be "offstream" in that the project would be built on a stream that produces very little water and would be filled from winter runoff conveyed from the Delta. Water would be pumped from the California Aqueduct into the existing

Los Banos Detention Reservoir and then into Los Banos Grandes for storage. Stored water would be released during water-short periods for use by agencies contracting for water from the SWP. This type of operation would be much the same as *that of* the nearby San Luis Reservoir, a joint-use facility of the SWP and CVP.

Except for new water supply, this alternative would have similar impacts as the No Project alternative in Kern County. There would be no overdraft correction or wildlife enhancement benefits and *only minimal* impacts on Kern County employment and tax revenues.

The potential environmental impacts of Los Banos Grandes Reservoir were preliminarily evaluated in a DWR report, "Offstream Storage Reservoir Sites South of the Delta: Reconnaissance Environmental Analysis" (Cal. DWR, April 1984). Ecological effects would include the inundation of reservoir site flora and displacement of amphibians, reptiles, birds and mammals on the site. The reservoir also would have minor local socioeconomic, recreational, and cultural impacts as a result of construction and operation. Appropriate mitigation measures would be implemented to avoid or minimize adverse effects.

Alternative 5. No Project

The No Project alternative involves the continuation of existing land use. No SWP recharge program or increase in SWP water supply would be developed. Water supply for irrigated agriculture would continue to be derived from pumped ground water, and long-term overdraft conditions would continue to cause declines in the local ground water levels in this area. Additionally, declining ground water levels could potentially induce damaging subsurface inflows of unusable ground water from aquifers to the west.

Continuation of current agricultural practices would preclude native habitat enhancement. No additional habitat would be developed for sensitive species, and no additional wetlands would be created to benefit waterfowl.

Employment and tax revenues would remain unchanged.

Although the effects of any one facility (such as the Tenneco land purchase) may be limited in the SWP service areas, cumulatively, the SWP could have a major impact upon the State. Similarly, substantial detrimental effects will be incurred if the present capacity of the SWP (about 2.3 million acre-feet) is not increased to the contractual yield of about 4.2 million acre-feet by year 2020.

By 2020, if the SWP is not completed, the State could lose \$10.5 billion annually in primary income (\$35.3 billion in primary and secondary income) during average hydrologic years. During a dry year, the loss of primary income would increase to \$14.4 billion (\$49.0 billion of primary and secondary income). The resulting annual loss of primary employment during an average hydrologic year would be 285,900 person years. During a dry year, the primary employment loss would be 390,000 person years (Department of Water Resources, 1985).

Other Alternatives Considered But Rejected

Buy-Back of SWP Entitlement

DWR is evaluating a program to purchase entitlement water from some agricultural contractors to help firm up the project's capability to meet entitlement deliveries. While such proposals deserve consideration of their potential to reduce SWP demands, they are not alternatives to a ground water storage program but they may be related projects.

Chapter 8. RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF THE ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

The proposed project would be capable of transporting water for recharge, storage, and extraction for many years, if the facilities were properly maintained. The short-term uses of the environment would occur primarily during and shortly after construction. The short-term effects would be minimal in relation to the long-term productivity resulting from construction and operation of the proposed facilities.

The project would help correct long-term overdraft conditions in Kern County, increase the delivery capability of the SWP, increase the reliability of imported water supplies, and increase the efficiency of the conjunctive operation of existing SWP facilities with ground water storage. The proposed plan would also provide long-term protection and enhancement of habitat for wildlife.

Chapter 9. SIGNIFICANT IRREVERSIBLE ENVIRONMENTAL CHANGES

The proposed project may result in the loss of agricultural uses of the land. Permanent changes in land use *also would* occur where wells, canals, pumps, and other facilities are needed. Resources and energy required to manufacture the steel and concrete used for construction and long-term operation of the proposed project would be irretrievably committed.

Chapter 10. CUMULATIVE EFFECTS

The operation of several proposed or on-line projects, both within Kern County and in other parts of the State, could interact with and compound the cumulative environmental effects of the proposed action. Existing and proposed facilities that would be affected include Lake Oroville, the additional pumping units at the Harvey O. Banks Delta Pumping Plant, and the recharge programs of the City of Bakersfield and Rosedale-Rio Bravo WSD. In addition, the operation of the proposed project will stimulate economic activity in the SWP service areas. Appropriate mitigation for impacts of the future development of SWP facilities will be formulated as specific projects are proposed and their impacts identified in other environmental reports.

Lake Oroville

The operation of the proposed action assumes: (1) no through-Delta facility would be available, (2) SWP/CVP will share water available for export from the Delta on the basis of the Coordinated Operation Agreement, and (3) minimum Delta outflow requirements will be those specified by the State Water Resources Control Board Decision 1485.

The supply of water for the SWP recharge program will be developed principally from (1) Delta excess outflows, (2) reduced surplus water deliveries, and (3) reduced unscheduled water deliveries. During storage withdrawal periods, supplies for the SWP recharge program may be obtained by withdrawing water from Lake Oroville. Such an action will occur through the SWP rule-curve operations process then in effect and will have minimal impact on Lake Oroville. This impact will be a slight reduction in storage earlier in the storage withdrawal season during water years classified as above-normal or wet.

Additional Pumping Units - Harvey O. Banks Delta Pumping Plant

The Department of Water Resources proposes to install and operate four additional pumping units at the Harvey O. Banks Delta Pumping Plant. The four additional pumps would increase pumping capability to the 10,300 cfs design capacity of the California Aqueduct between the Banks Pumping Plant discharge outlet and Bethany Reservoir. The purpose of these additional units are to minimize on-peak power requirements, to improve the efficient use of existing power generating facilities, and to reduce costs for the SWP; to provide standby pumping capacity to compensate for outages of the existing units; and to increase reliability of SWP supply deliveries.

With or without additional pumps, efficient operation of the SWP would optimize operations to best use unregulated Delta flows that are surplus to Decision 1485 requirements. This would minimize diversions during regulated flow periods, minimize carriage water releases from Oroville, and conserve water in storage for release during dry and critical years. Optimal use of unregulated winter and spring flows to increase storage in San Luis Reservoir would enable a reduction of summer exports to conserve upstream storage and reduce fish entrainment during period of high abundance. When San Luis Reservoir is at or above the minimum monthly storage levels to enable scheduled deliveries the following year (if it is a critical year), there is a potential for intermittent export deliveries for locally managed ground water programs. This potential increases with increased diversion capability at Clifton Court Forebay. This potential will be reduced if a SWP ground water storage program is implemented.

Other Recharge Basins

While a specific plan of operation has not been identified, the recharge program will be designed to maintain maximum long-term infiltration rates. Daily operations will be managed to maximize the

subsurface movement of water away from the facility. The project also will be operated in coordination with the recharge facilities of other agencies to ensure minimum interference. The recharge facilities of the City of Bakersfield and Rosedale-Rio Bravo WSD are of primary concern.

Ground water model projections made to simulate the operation of the SWP recharge program showed that the potential exists for mounding under the project area following a series of local wet years. If excessive mounding were to take place, the storage capacity of adjacent recharge programs would decline. By monitoring ground water levels under the project, the effects on adjacent operations can be minimized. During periods of extraction, water levels in areas adjacent to the project may decline. If water levels decline significantly, the effects could be minimized by expanding the surface distribution systems to reduce the need for local pumping during periods of heavy extractions or by deepening existing wells.

Kern River Intertie

If project facilities *are to be* used to recharge local water, *the excess flows currently discharged into* the California Aqueduct through the Kern River Intertie will be reduced.

SWP Service Areas

The increased yield resulting from the ground water recharge program will stimulate economic activity in the SWP service areas. While not all population changes and associated environmental impacts can be attributed to changes in water management, certain segments of the economy do respond to the relative availability of water.

After allocating the recharge program's average annual yield to the service areas (based upon entitlement proportions), income and employment factors from the DWR report, State Water Project, "Service Area Impact Study" (Cal. DWR, May 1, 1985) will be applied to the yield allocations to determine impacts. Since future SWP deliveries for agricultural uses will be replacing current surplus deliveries with entitlement deliveries in the San Joaquin service area, there will be minimal changes in socioeconomic activity in this service area attributable to this project. Also, future SWP deliveries to the Southern California service area will be replacing Colorado River supplies, which *will be diverted by* the Central Arizona Project as a result of a 1964 Supreme Court decision. Thus, there will also be minimal changes in socioeconomic activity in this service area attributable to the project.

Chapter 11. LEGAL AND INSTITUTIONAL CONSIDERATIONS

Legal and institutional factors that must be considered in deciding whether to engage in a program of artificial recharge, storage, and overdraft correction for the SWP in Kern County include provisions of recent legislation, agreements among agencies, and court decisions concerning ground water.

Key legal precedents concerning the storage of imported water in a ground water basin include *The City of Los Angeles v. City of San Fernando* (1975) 14 Cal. 3d 199, and *Niles Sand and Gravel Company, Inc. v. Alameda County Water District* (1974) 37 Cal. App. 3d 924. The California Supreme Court (in the first case) and the First Appellate District Court (in the second case) ruled in favor of giving public agencies certain rights in ground water basins and the authority necessary to implement a ground water storage program.

The decision in the San Fernando case resolved a suit filed by the City of Los Angeles to quiet its title and obtain a declaration of its prior rights to the water in the San Fernando Basin. The City claimed rights to ground water it had imported into the basin. The California Supreme Court upheld this claim.

In the Alameda County Water District case, the water district raised the water table in the vicinity of the Niles Sand and Gravel Company's excavations and caused some flooding. The gravel company was pumping the water that flooded its excavated areas and discharging it into San Francisco Bay. However, the gravel pit had historically held local water supplies, and the ground water level created by the Alameda County Water District's replenishment program was below the historic level. The court held that the water district had a right to store water in natural underground storage space and to prevent the gravel company from taking the stored water, even though the water district was not contemplating capturing the stored water. This confirmed the contention that overlying cities have the right to recapture waters imported from any source that they place in a ground water basin.

The opinions in these two cases confirm and clarify public agencies' rights to use ground water storage capacity for storage of imported water.

DWR's authority from these decisions was strengthened by legislation by Senator Ruben Ayala, which was signed by the Governor in July 1985 (Chapter 268 of the Statutes of 1985). This statute, now Water Code Section 11258, expressly authorizes DWR to use groundwater storage space south of the Sacramento-San Joaquin Delta to provide yield for the SWP. The statute further provides that a groundwater storage facility shall be constructed or operated within the boundaries of an agency that has contracted for a water supply from the SWP unless the Department enters into a contract with that agency concerning the groundwater storage facility. As a result, DWR will need to enter into a contract with KCWA before constructing or operating the facility.

The project would be located in an unadjudicated ground water basin. To avoid legal complications, the Department is proposing to limit the ground water operation to the use of imported water and to keep detailed records of the amounts of water recharged and extracted. The Department does not plan to extract native ground water, despite the proposed acquisition of lands overlying the ground water basin.

Chapter 12. GROWTH-INDUCING IMPACTS

Growth-inducing impacts of the Tenneco West Incorporated land purchase will occur due to the increased yield that will be delivered to the SWP service areas. This increased yield will affect economic activity. Although the relationship between water and economic activity is apparent and direct in the case of agriculture (so much water equals so much irrigated acreage which, in turn, results in so much employment and income), the factors affecting urban growth are complex. On a local basis, the provision or nonprovision of water hookups can control growth. However, on a regional basis where there are no overall growth policies or controls, growth is the product of both demographic and socioeconomic influences.

The approach used for this EIR to link water deliveries to economic activity was adapted from the *State Water Project Service Area Impact Study* (Cal. DWR, May 1, 1985). The study associated water-related economic growth with industries that are water-dependent. It recognized that certain sectors of the economy necessarily respond to the availability of water, while others do not. Not all population change and associated environmental impacts can be attributed to water. This appears to be reasonable when considering an individual's decisions to have or not to have children, the various reasons people move, government migration policies and the effectiveness of those policies, and the State's highly industrialized base.

The growth potential of the economic impacts does not mean additional levels of socioeconomic activity will exceed official State and/or local agency forecasts. These forecasts generally assume that adequate levels of resources (including water) would be present to support the projections. Thus, the impact of completing the SWP (including the proposed action) is embodied in these projections.

Chapter 13. FINANCING

The primary purpose of the proposed project is to increase the SWP water delivery capability by conserving excess Delta flows for delivery in later dry years. Operated in this manner, the project would qualify as an "additional conservation facility" in the water supply contracts that the State has entered into with the thirty local water agencies and districts.

The State would most likely finance the acquisition of land and the construction of the necessary facilities by the sale of long-term revenue bonds under the authority of the Central Valley Project Act. Monies to pay the annual revenue bond debt payments and the annual operating costs would be collected from the SWP water supply contractors under provisions of the existing or amended water supply contracts.

Chapter 14. COMMENTS AND RESPONSES

The program Draft Environmental Impact Report on the Kern Water Bank was distributed for review in May 1986. A public hearing to receive questions and comments on the Draft EIR was held on June 25, 1986, in Bakersfield. In addition, oral and written comments were received during the review period. The Department of Water Resources recognizes that many of the details of the Kern Water Bank program have yet to be completed. The Department chose to prepare a program EIR for this project so that there could be CEQA compliance and environmental analysis as early as possible in the development of this project when the greatest flexibility exists for making adjustments in the program in response to environmental considerations. Some form of CEQA compliance was needed at this early stage because the Department was undertaking discretionary decisions that needed the benefit of environmental analysis.

By using the Program EIR device, the Department does not plan to short circuit later environmental analysis. On the contrary, use of a program EIR commits the Department to further environmental review with each later decision implementing the program. If new environmental effects would be caused by a later decision, the Department will undertake an initial study to determine whether the decision would cause a significant effect on the environment. If a significant effect would result, the Department will prepare a supplement to the program EIR.

The California Environmental Quality Act of 1970 (CEQA) requires that the Lead Agency respond in writing to all comments received during the public review of the Draft Environmental Impact Report. The comments, the list of commentors, responses to the comments, the Draft EIR, and the revisions to the Draft EIR constitute the Final EIR.

Agencies, organizations, and individuals who responded to the Draft EIR include:

- ☐ Department of Conservation
- ☐ Department of Fish and Game
- ☐ Department of Transportation
- ☐ State Water Resources Control Board
- ☐ The Reclamation Board
- ☐ State Water Contractors
- ☐ U. S. Fish and Wildlife Service
- ☐ Kern County California Native Plant Society
- ☐ Kern County Water Agency
- ☐ The Metropolitan Water District of Southern California
- ☐ North Kern Water Storage District
- ☐ West Kern Water District
- ☐ Tenneco Oil Exploration and Production
- ☐ Wheeler Ridge-Maricopa Water Storage District

- Tulare Lake Basin Water Storage District
- Buena Vista Water Storage District
- Rosedale-Rio Bravo Water Storage District
- Henry Miller Water District
- City of Bakersfield, Community Services Department and Planning Department
- Belridge Water Storage District
- Semitropic Water Storage District
- Kern Delta Water District
- Coachella Valley Water District
- Kern County Public Works Department
- German Shorthaired Pointer Club of Southern California
- California Brittany Club
- Merrell Kennels
- Northern California Brittany Club, Inc.
- Lawrence A. Green
- George Nickel, Jr.
- Dan Chapin

This chapter contains copies of the written comments received and specific responses to them.

Changes to the Draft EIR have been made in *classic italic* to ease their recognition. Some of the changes were made as a result of comments received, whereas others were made to clarify information presented in the Draft EIR.

The Final EIR was repaged. Table 12 on page 192 identifies where major additions can be found in the Final EIR. Copies of the Final EIR will be furnished to those who received the Draft EIR, as well as others who request a copy of the final EIR.

COMMENTS AND RESPONSES

- 111 -

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C-087985

Memorandum

To : Dr. Gordon F. Snow
Assistant Secretary for Resources

Donald J. Finlayson, Chief
Planning Branch
Department of Water Resources
P. O. Box 388
Sacramento, CA 95802

From : Department of Conservation—Office of the Director

Date : JUL 17 1986

Subject: Draft Environmental
Impact Report (DEIR)
for the Department
of Water Resources
Farm Water Bank; SCH
86031710

Dr. Snow and Mr. Finlayson
Page 2

The Department of Conservation is responsible for monitoring farmland conversion on a statewide basis. The Department also administers the California Land Conservation (Williamson) Act. We have reviewed the Department of Water Resources' DEIR for the project referenced above, and have noted that the proposal may involve the conversion of valuable farmland. The Department, therefore, offers the following comments.

The proposal would involve the purchase of approximately 32,000 acres of agricultural land, all of which is currently under Williamson Act contracts and in agriculture production, for a ground water basin recharge, extraction, and storage project in Kern County. All irrigated agriculture would be terminated, although the DEIR indicates that non-irrigated agriculture could continue.

We bring to your attention Government Code §51292, which requires the notification of this Department when any public agency considers the acquisition of land in an agricultural preserve for placement of a public improvement. The Department of Water Resources should provide such formal notification as soon as possible. 1

The DEIR provides a basic discussion of the current agricultural operations. Given the significance of the proposal on the future use of agricultural lands in the project area, we believe a more detailed examination of the impacts of the project on agricultural lands is in order. 2

The Final Environment Impact Report (FEIR) should provide specific information on the number of acres of agricultural land to be taken out of production, the potential agricultural value of the site, the impacts of the conversion of that land and the possible mitigation actions which would reduce the significant residual impact on prime agricultural land. We recommend the FEIR contain the following information to ensure the adequate assessment of the project's impacts in these areas. 3

- o The agricultural character of the area covered by the project and of nearby or surrounding lands which may be affected by the conversion. 4

- Identify number of acres of land, type of land (i.e. prime/non-prime) and location.
- Types and relative yields of crops grown.
- Agricultural potential based on the U. S. Department of Agriculture's Land Capability classifications.
- The impact upon current and future agricultural operations.

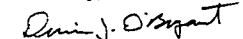
- o The impacts of any required terminations of Williamson Act contracts(s) affecting the property, as well as a discussion of the effects that termination of Williamson Act contracts would have on nearby properties also under contract. 5

- o Farmland Conversion Impacts

- The type and amount of farmland conversion, if any, that would result from implementation of the project, including potential crop yields that would be lost. 6
- The proportion of the County's total farmland that this conversion would represent.
- The proportion of the County's total acreage of those crops currently grown at the proposed sites that this project would represent.
- The impact of the project on other farmland in this area of Kern County.
- The cumulative impact of the project on other farmland in and around the project area.

The Department appreciates the opportunity to comment on the DEIR. We hope that the farmland conversion impact and the Williamson Act contract issues are given adequate consideration in the FEIR. If I can be of further assistance, please feel free to call me at (916) 322-5873.

Sincerely,



Dennis J. O'Bryant
Environmental Program Coordinator

cc: Stephen Oliva, Manager, Land Conservation Unit

Commenting Agency: California Department of Conservation

- Response 1: In regard to the application of Government Code 51292, Agricultural Lands, to the Kern Water Bank project as a public improvement, the following should be considered:
- (a) The land in the project site will remain in a condition acceptable for agriculture.
 - (b) The potential for continuation of saline land reclamation is possible.
 - (c) Ground water overdraft will be reduced.
 - (d) Rezoning some of the agricultural land in the project area for urban use has recently occurred.
 - (e) The present agricultural depression makes alternate use of the land more agreeable to many people.
- Response 2: See responses to comments 4, 5, and 6.
- Response 3: See responses to comments 4, 5, and 6.
- Response 4: The project is located on the lower end of the Kern River and westside alluvial fans. Much of the land adjacent to the Kern River Channel is sandy and highly permeable, but is mostly excluded from the land purchase. A large part of the project lies more distant from the river's main channel and includes less permeable soil material.
- Saline land reclamation has occurred in and around the project site. The more permeable sandy soils have been leached of excess salt (reclaimed) while the remaining land ranges from a salt free condition to that of saline. The major crop on the site is cotton, largely attributed to climate and the ability of cotton to tolerate salinity. Other crops of importance are alfalfa, barley, wheat, sorghum, corn, dry beans, and some types of vegetables. It is estimated that yields are about average.
- Of the approximately 48,000 acres referred to in the Draft EIR, about 31,800 acres are irrigated cropland and appear to qualify as prime agricultural lands according to the USDA, Soil Conservation Service definition. Based on USDA's land capability classification, all of the cropped, fallow, and idle lands fit into class I, IIs4, IIs5, IIs6, and IIIs6, Figure 12a. These lands are suited to the crops being grown in the area. Much of the undeveloped land would also be in these classes if developed to irrigation.
- Response 5: Termination of Williamson Act contracts should not impact nearby properties under contract.
- Response 6: The maximum proportion of converted land to total county farmland would be less than 5 percent. Assuming the project is well monitored for water movement, no impact should be noted on adjacent current or future agricultural operations.

Memorandum

To : 1. Resources Agency
Projects Coordinator
2. Department of Water Resources
Don Finlayson

Date : July 22, 1986

From : Department of Fish and Game

Subject : Kern Water Bank Draft EIR, SCH 86031710, Kern County

The Department of Fish and Game has reviewed the Draft EIR for the Department of Water Resources (DWR) artificial recharge, storage, and overdraft correction program in the Kern River fan area of Kern County. We have previously reviewed the Notice of Preparation (NOP) for this EIR and provided comments directly to Ms. Delores Brown of DWR.

The project would purchase about 46,000 acres of land north of Taft, retire parts of it from agricultural use, and use a 3500-acre portion of former agricultural lands for groundwater recharge and underground storage.

In our comments on the NOP we noted that although the project had the potential to jeopardize state-listed threatened or endangered species, that sufficient acreage was included in the acquisition proposal to adjust the siting of project facilities so as to avoid any jeopardy.

As we stated in our comments on the NOP, there is a potential impact on rare, threatened or endangered plant and animal species and communities if the development of subsurface mineral rights leads to disturbance of areas occupied by such species. We believe that oil extraction can be carried out with minimal impact by means such as cluster development, slant drilling and avoidance of critical habitat during development of surface facilities. The DWR should explore the alternative of fee purchase of the land followed by resale of mineral and mineral extraction rights, subject to conditions necessary for avoidance of harm to listed species. Because Kern County has zoned the area for oil extraction, the County regards oil development permits as ministerial, and does not provide any environmental review opportunity prior to such development. The DWR would help carry out the intent of the California Endangered Species Act if it were to include in its ownership interest the rights necessary to guide development away from critical habitats for state-listed wildlife.

We support DWR's proposal to eventually site percolation ponds on lands now used for agriculture, and this would help assure no jeopardy to listed species would occur. Site surveys would still be necessary prior to construction to be certain no listed species

-2-

had begun using the agricultural land after acquisition but prior to pond construction.

We are pleased to see the attention to wetland establishment and natural plant community restoration in the percolation areas and buffer lands. We agree there is potential for wildlife enhancement, particularly waterfowl, wetland and riparian habitat improvements, and we agree that proper management of waterfowl will be needed to avoid problems related to excessive concentration of birds and waterfowl disease transmission.

We are prepared to work further with DWR in development of a multi-resource enhancement program on this project. For details or answers to questions regarding these comments, please contact Mr. George Nokes, Regional Manager, Region 4, 1234 E. Shaw Avenue, Fresno, CA 93710; or telephone (209) 222-3761.

Jack C. Parnell
Jack C. Parnell
Director

Commenting Agency: California Department of Fish and Game

- Response 1: The mineral rights to the Tenneco property have not been offered for sale and will probably not be acquired by the Department. However, prior to purchasing the Tenneco property, the Department will negotiate the mineral rights on the property.
- Response 2: The Department intends to consult with Fish and Game in the development of a compatible land use plan.
- Response 3: Same response as comment 2.

Memorandum

To : Executive Officer
State Clearinghouse
1400-10th Street
Sacramento, CA 95814

Attn: Peggy L. Osborn

From : District 6 Transportation Planning
DEPARTMENT OF TRANSPORTATION

Subject: Kern Water Bank

Date: July 8, 1986

File: 6-Ker-5, 43, 119
SCH 86031710

We have reviewed the draft EIR on the Kern Water Bank. As stated in the document, page 44, this project involves three State Routes (5, 119, and 43).

Figures 10 and 11, pages 35 and 36 respectively, do not accurately show the southern leg of State Route 43 extending south of I-5 and junctioning with State Route 119. Maps should be corrected. Please discuss in the EIR the extent, if any, that flood waters or artificially inflated water tables may affect any State routes in the project area.

We have no further comment on this project.

Nathan M. Smith
NATHAN M. SMITH
District 6 Transportation Planner

MLD:VT

Commenting Agency: CA Department of Transportation-District 6, Transportation Planning

Response 1: Figures 10 and 11 (pages 45 and 46) have been corrected.

Response 2: The proposed project will not encroach upon existing floodways in the area and should not increase flooding of State routes. By increasing the absorptive capacity for Kern River flood flows, the project should result in reduced Kern River flows during severe floods. Ground water levels in the project area will be monitored and the project operated to prevent artificially inflated ground water levels from affecting State routes.

STATE WATER RESOURCES CONTROL BOARD

THE PAUL R. BONDERSON BUILDING
801 P Street, Sacramento, CA
(916) 324-5639

DIVISION OF WATER RIGHTS

P.O. BOX 2000, Sacramento, CA 95810



JULY 17 1986

In Reply Refer
to: 316:GS:266.0

State Clearinghouse
1400 Tenth Street, Room 121
Sacramento, CA 95814

SCH #86031710, ARTIFICIAL RECHARGE, STORAGE AND OVERDRAFT CORRECTION
PROGRAM IN KERN RIVER FAN AREA, KERN COUNTY, CA (KERN WATER BANK)

Because many of the details of the proposed project have yet to be defined the Lead Agency on this project, the Department of Water Resources (DWR), has prepared a Program Environmental Impact Report (EIR) for the proposed project. As a Responsible Agency on this project much of the detailed information necessary for our review of the project has not been specified at the Program EIR stage. When the specifics of the project have been worked out a new EIR documenting these specifics will have to be prepared by the Lead Agency and circulated to all Responsible Agencies (see CEQA Guidelines, Section 15168).

The Division of Water Rights cannot issue any revised water right permits or new permits for this project until a more specific EIR is prepared which addresses all of the environmental impacts associated with the project. Listed below are some examples of the specific issues which the Final EIR must address.

- 1. On Page 15, fourth paragraph in the Draft Program EIR, it is stated that "additional surface water also will be developed." The Final EIR should outline in detail all existing water rights which will be utilized by the project; any amendments necessary to the existing water rights such as changes in points of diversion, re-diversion, storage or use; any new water rights required (such as from the Kern River) for the operation of the project. The Final EIR should address all environmental impacts associated with any new or amended water rights.
- 2. On Page 15, second paragraph in the Draft Program EIR it is stated that "Losses on recharge are 5 percent. Water movement out of the project site by underflow will be determined by a separate groundwater simulation model and the amount that may be considered lost will be subject to negotiation with local agencies." The Final EIR will have to describe the agreements reached with local agencies and how the 5 percent loss figure is arrived at.
- 3. The discussions which begin on Page 32 of the Draft Program EIR indicate that the aquifer which will be recharged and extracted from as part of this project spreads beyond the project's surface boundaries. The Final EIR will have to describe how the State will control, monitor, and



State Clearinghouse

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JULY 17 1986

maintain accurate accounting of extraction of State Water Project water from this aquifer by the State or other entities. The Final EIR will also have to describe how the natural recharge of this aquifer will interact with the project and how this will be monitored.

- 4. On Page 93, fourth paragraph, the Draft Program EIR states that the rapid drawdown of Lake Oroville associated with the project will effect power generation and fishery habitat and reduce the recreational potential of Lake Oroville. The Final EIR will have to outline in detail the seasonal timing of the drawdown in Lake Oroville, the pumping in the Delta, and the recharge activity. The environmental impacts will have to be documented with regard to drawdown impacts on Lake Oroville, recreational activity, fishery resources, the riparian ecology of the downstream systems, etc. The Final EIR will also have to address the impacts associated with the additional pumping at Clifton Court Forebay on the ecology, fishery resources and water quality of the Delta.
- 5. On Page 2-1, second paragraph, and in other places throughout the document, it is stated that the proposed project could enhance wildlife by developing intermittent wetlands and/or revegetating agricultural lands. However, on Page 12, second paragraph, it is stated that these recharge ponds will be reconditioned and scarified on a rotational basis. The Final EIR should explain how the reconditioning and scarification will effect the quality of the recharge areas for wildlife.
- 6. Four threatened endangered and candidate wildlife species--the San Joaquin kit fox, blunt-nosed leopard lizard, San Joaquin antelope squirrel, and giant kangaroo rat--are known to inhabit some areas on the project. Page 72, third paragraph, states that these species would benefit from the project. Since these are not wetland species, the Final EIR should explain in detail the impact the project will have on these species and explain how the project will generate or improve habitat for these species.

Thank you for the opportunity to comment on the Draft Program EIR. To assist you in your preparation of the Final EIR, we have enclosed a suggested outline (plus addendum) for environmental impact reports involving water development. If you need further clarification in this matter, please give me a call at (916) 324-5639 or Greg Sutter of our staff at (916) 324-5718.

Sincerely,

Ross Swenerton
Ross Swenerton, Chief
Environmental Unit

Enclosure

Commenting Agency: The Water Resources Control Board, Division of Water Rights

Response 1: The Department of Water Resources prepared a program EIR on the Kern Water Bank project in order to provide environmental analysis at an early point in project development and planning. In doing so, the Department recognized that many points of analysis would be general in nature with an emphasis on secondary effects leaving many specific details to later points in the process. This approach is authorized by Section 15168 of the State CEQA Guidelines.

The program EIR concept also includes the idea of environmental analysis at each successive stage of the project to determine whether the environmental effects of that stage are adequately analyzed by the program EIR. If a later stage of project development is found to involve new significant effects on the environment, a supplement to the program EIR will be prepared with a more detailed project description and additional environmental analysis.

The approach taken with this program EIR is consistent with the general policy of conducting environmental analysis as early as feasible in the development of projects. See *Bozung v. Local Agency Formation Commission* (1975), 13 Cal. 3d 263, *Fullerton Joint Union High School District v. State Board of Education* (1982), 32 Cal. 3d 779, and *City of Carmel-by-the-Sea v. Board of Supervisors* (1986), 183 Cal. App. 3d 229.

Many of the detailed questions raised by the State Water Resources Control Board cannot be answered at this time but will be addressed at later stages of project development. We do not agree with the assertion that the many specific details about water rights must be added to the final EIR at this time.

This program EIR does not evaluate the additional water rights needs, if any, of the proposed project. Under existing water rights, the Department has the authority to divert up to the maximum under its contracts. The Department believes that these rights are sufficient for operation of the Kern Water Bank as currently envisioned.

The Department of Water Resources is currently evaluating various other sources of additional water supplies. These other sources would be related but independent parts of the Department's ongoing attempt to develop supplies to meet its contractual commitments with its thirty water supply contractors. Existing sources can supply approximately 2.3 million acre-feet of water annually of the over 4 million acre-feet under contract. Even with vigorous demand-reducing, water conservation efforts, and with the Kern Water Bank in operation, the Department envisions that additional supplies will be needed. The need for specific additions to existing rights or changes will be evaluated as specific projects are identified.

Response 2: Recharge rates anticipated for the project range from 0.5 to 0.33 acre-feet per acre per day, or between 120.4 and 182.5 acre-feet per acre annually. Evaporation rates measured in Kern County at the U. S. Bureau of Reclamation Delano Government Camp Station have averaged about 6.5 acre-feet per acre annually

between 1953 and 1979. The ratio of evaporation loss to recharge therefore ranges from about 0.036 to 0.054 with 5 percent being an estimate. The recharge losses in actual operation will be estimated according to procedures contained in agreements with local agencies. These procedures will include provision for field measurements of loss rates at the project site. The justification for the 5 percent figure has been added to Page 23 of the final EIR.

Response 3: These subjects will be addressed in the agreements with the local agencies.

Response 4: Operation studies for both 1990 and 2000 conditions with the Kern Water Bank indicate that Oroville Reservoir would drop below minimum power pool (minimum power pool is at elevation 640 feet above sea level) less than two percent of the time. In the 1990 studies, operation of the Kern Water Bank would drop below minimum power pool about one percent, with no additional change noted for the 2000 studies.

Drawdowns at Lake Oroville will most likely occur in the fall and winter months in response to rainfall. The effect on the fishery and recreation during this time is expected to be minimum.

The effects at Clifton Court Forebay are also expected to be minimum during the wetter months. However, if the operation of Kern Water Bank degrades the Delta ecosystem, appropriate mitigation measures will be taken.

Response 5: The exact locations of the physical facilities needed to spread water for ground water recharge are still being determined. If the recharge basins are located in areas currently being used for agriculture then the reconditioning and scarification process would present no new significant effects for wildlife. Areas not needed for physical facilities would be allowed to revert to native vegetation which will be beneficial for wildlife.

Response 6: As stated on page 82, it is not likely that the project will affect threatened, endangered, or candidate species since construction will be confined primarily to lands presently in agricultural production. Before the percolation ponds are constructed, a field survey by qualified biologists will be performed to ensure the absence of sensitive species.

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Memorandum

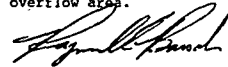
To : Delores Brown
Division of Planning
Department of Water Resources
1416 Ninth Street
Sacramento, CA 95814

Date : June 18, 1986
File No.
Subject: EIR for Kern
River Recharge Area

From : THE RECLAMATION BOARD
Department of Water Resources

The Reclamation Board has reviewed the Draft Environmental Impact Report for the proposed Kern River Artificial Recharge Project.

There is no mention of possible impacts to flood control facilities in the project area. The Reclamation Board adopted a designated floodway in the proposed project area in 1976 and exercises permit authority over the Kern River and adjacent overflow area. 1



RAYMOND E. BARSCH
General Manager
ATSS 485-9454

cc: Jake Angel

Commenting Agency: The Reclamation Board

Response 1: The proposed project and alternatives will be generally designed to avoid floodway encroachment. In the event of encroachment the Department or its assignee will acquire the appropriate permits from the Reclamation Board.

state water contractors

Directors
James M. Stutzman,
President
Santa Barbara County Flood
Control and Water
Conservation District
Wallace G. Spieser,
Vice President
Antelope Valley - East Kern
Water Agency
Thomas R. Harbutt,
Secretary-Treasurer
Tulare Lake Basin Water
Storage District
Ranald R. Esau,
Santa Clara Valley
Water District
Eugene H. Knapp,
Solano County Flood
Control and Water
Conservation District
Byron E. Hellert,
Metropolitan Water District of
Southern California
Rube H. McKinney,
Castro Municipal
Water District
Stuart T. Pyle,
Kern County Water Agency
Lewell O. Weeks,
Coaches Valley
Water District

July 28, 1986

Ms. Delores Brown
Department of Water Resources
P.O. Box 942836
Sacramento, CA 94236

Dear Ms. Brown:

The State Water Contractors (SWC) has reviewed the Kern Water Bank Program Environmental Impact Report (EIR) and appreciates the opportunity to comment on the proposed program. The SWC support the Department's efforts to store surplus Delta flows in the Kern River Fan ground water basin. The contractors do, however, have questions concerning the operation of the basin, the costs associated with the project, and technical issues such as the storage capability of the basin. None of the SWC concerns directly effect your evaluation of environmental impacts of the proposed project.

The Department states on page two of the EIR that pre-feasibility studies on State Water Project (SWP) operations, a ground water model, and, the economic analyses will be made and the results reviewed with the SWP contractors before a decision is made to purchase all or a portion of the property needed to develop the Kern Water Bank. These pre-feasibility studies should answer the SWC's questions concerning the proposed project and allow the Department and SWC decide on the feasibility of developing additional SWP firm water supplies through ground water storage in Kern County.

Ms. Delores Brown
July 28, 1986
Page Two

Again, thank you for providing the opportunity to comment on the program EIR and the SWC look forward to working with the Department on the proposed program.

Sincerely,

David R. Schuster
David R. Schuster
General Manager

cc: All Member Agencies
Senator Ruben Ayala, Chairman, Senate Agriculture and Water
Resources Committee
Mr. William T. Balch

Commenting Agency: State Water Contractors

Response 1: The Department will continue to consult with the contractors on these issues..



United States Department of the Interior

FISH AND WILDLIFE SERVICE
Division of Ecological Services
2800 Cottage Way, Room E-1803
Sacramento, California 95825

July 17, 1986

Ms. Delores Brown
California Department of Water Resources
P.O. Box 942336
Sacramento, California 94236-0001

Dear Ms. Brown:

We have reviewed the Draft Environmental Impact Report titled "Artificial Recharge, Storage and Overdraft Correction Program in Kern River Farm Area, Kern County, California (Kern Water Bank)" and provide the following comments for your consideration.

We understand that the purpose of the proposed project at this point involves acquisition of up to 46,000 acres of land located about 12 miles southwest of Bakersfield in Kern County. The land is required for groundwater recharge from State Water Project (SWP) water in years of abundant supply for later extraction and use in years of deficient supply. In addition, the proposed project would: (1) reduce current groundwater overdraft of 250,000 to 300,000 acre-feet per year by 70,000 acre-feet, and (2) provide wildlife enhancement opportunities in the area with the development of approximately 3,500 acres of recharge basins while the remaining land area, about 42,500 acres excluding the recharge basins and appurtenant facilities, would be allowed to revert to natural habitat. To encourage native reversion, some disturbed areas may be reseeded with vegetation compatible with wildlife.

The exact locations of the physical facilities to spread water for groundwater recharge, to extract water from groundwater storage, and to convey water to the storage sites are unknown at this time, but will be determined at a later date. We further understand that the ponded areas for groundwater intrusion will all be located on existing farmland and, prior to any construction activities, field surveys of sensitive vegetation and threatened and endangered species will take place.

In view of the preceding, we believe that the proposed project as perceived will benefit wildlife, especially those terrestrial resident species that will inhabit the 40,000-plus acres that will revert to a more natural habitat area. However, we do have several concerns that the proposal could adversely impact fish and wildlife.

The concerns are indicated as follows:

1. The proposal will increase the delivery capability of the SWP (page 89) and subsequently expand irrigation use. This expansion will result in an increased use of pesticides and fertilizers. The DEIR should indicate the estimated additional amount of chemical use.

2. The increase in irrigation will generate additional agricultural waste water that may contain toxics, requiring treatment or ponding for evaporation. The anticipated volume of additional agricultural waste water should be indicated in the DEIR.
3. A ten-mile long conveyance channel will be constructed from the California Aqueduct to the spreading fields. The extent of the channel will restrict movement of the endangered kit fox and other small mammals in the area. The design of the channel should take into consideration mammal passageways, etc. In addition, please be advised that should any components of the project have the potential to affect extant native habitat, your agency, as a part of your environmental planning process, should request a list of federally listed, proposed and candidate species which may occur in the area. Field surveys to determine presence/absence of these species and to effect a responsible avoidance and mitigation program should then be conducted.

Results of such surveys should be conveyed to our Sacramento Endangered Species Office. Initiation of formal consultation pursuant to Section 7 of the Endangered Species Act may be required if a listed species may be affected and a Federal agency involved with permitting, funding or otherwise authorizing the project action. Our contact in the Sacramento Endangered Species office to discuss these concerns should you need clarification, is Dr. Jack Williams. His telephone number is (916) 978-4866.

4. The water spreading ponds for groundwater intrusion will attract migratory birds for feeding, loafing and nesting. The operation of the ponds could result in ponds drying up during nesting seasons, stranding juvenile birds too young to fly. Pond operation and location should take into consideration the nesting habits of birds. However, if ponds are not isolated but operated in a series, the nesting problem may not be of concern.

We would like to compliment the Department of Water Resources for the overall consideration of wildlife and native habitat that is incorporated into this project. Measures planned to control botulism, allow recreational hunting, and expand wildlife habitat will definitely benefit the Kern County environment.

Please keep us informed of your ongoing planning so that we can provide additional information as appropriate. We appreciate this opportunity to comment.

Sincerely,

James D. Carson

James D. Carson
Acting Field Supervisor

cc: Reg. Dir., (AHR), Portland, OR
Kern-Pixley NWR Complex, Delano, CA
SESO, Sacramento

Commenting Agency: U. S. Department of the Interior, Fish and Wildlife Service

- Response 1: The water supply developed from this project will increase the dependability of supply but not contractual rights. Therefore, it will not cause additional lands to be placed into production. No increase in pesticide concentrations or additional agricultural waste should occur.
- Response 2: See response to comment 1.
- Response 3: Any channels constructed would be located primarily on irrigated lands and, therefore, would have a minimum impact on wildlife habitat. The reversion of irrigated lands to native habitat would more than mitigate for such impacts. Additional detailed environmental field work would precede any final project design.
- Response 4: The spreading ponds will be operated as a group, thereby, allowing some ponds to maintain about 2 to 4 feet of water, while other ponds are being reconditioned. By operating the spreading ponds in this manner, the opportunity for birds being stranded will be minimized.



3826 Bryn Mawr Dr.
Bakersfield, CA 93305

September 12, 1986

KERN CO. CNPS CALIFORNIA NATIVE PLANT SOCIETY

TO: Don Finlayson
Department of Water Resources
P.O. Box 2836
Sacramento, CA 94236-0001

RE: Comments on Draft EIR - "Artificial Recharge, Storage and Overdraft Correction Program in Kern River Fan Area, Kern County, Calif. (SCH No. 86031710, May 1986)."

Dear Mr. Finlayson:

Thank you for this opportunity to comment on the DEIR for the Kern County Recharge Project. We applaud the potentially beneficial aspects of the project for our very endangered southern San Joaquin Valley native plant communities and the wildlife that depends on them.

At this time, we have three very important areas of comment with respect to the DEIR:

- (1) Extend sensitive species list to include these additional Candidate Species which are extremely likely to have habitat in the project area: 1

--Atriplex hastata ssp. spicata (valley sink scrub)
--Caulanthus californicus (sandy Valley soils)
--Eatonella Condonii (sandy Valley soils)
--Eremolche kernensis (West Side plains and hills)
--Eriastrum Hooveri (sandy Valley soils)

According to Jim Bartel of the Endangered Species Office in Sacramento (U.S. Fish and Wildlife Service), listing packages will be developed shortly for Eatonella (Threatened), Eriastrum (Threatened), and Caulanthus (Endangered). The sandy loams of the project area may well presently support populations of these species, and/or their reintroduction may be possible on lands with existing native vegetation or abandoned agricultural lands.

- (2) Incorporate a comprehensive survey of the 11,000 acres of native vegetated lands throughout the Spring of 1987 and subsequent years into the Project Plan. This type of survey is necessary in order to identify positively the plant resources on the property. Isolated, generally poorly timed, preconstruction surveys for these ephemeral rare plants are totally inadequate to protect rare plants. 2
- (3) Reintroduce native vegetation, including sensitive species, on abandoned agricultural land. 3

Please let us know if you have questions about these comments or if we can assist in any way in future vegetation studies. The project certainly has a fantastic potential for aiding in the preservation of many sensitive plant species in the southern San Joaquin Valley.

Sincerely yours,
Diane L. Mitchell
Diane L. Mitchell

cc: Ken Berg, *SLP* CNPS

Commenting Agency: Kern County California Native Plant Society

- Response 1: These additional species were added to the species list on page 50.
- Response 2: As stated on page 79 of the Draft EIR, before excavation and/or construction begins in areas where sensitive species may occur, a field survey would be conducted. This study would be scheduled following a decision to purchase the property.
- Response 3: The Department intends to allow those lands not used directly for recharge basins and appurtenant facilities to revert to natural conditions. To encourage native reversion, some disturbed areas may be reseeded with vegetation compatible with wildlife and the adjacent agricultural activity. In certain areas, however, dry farming may be allowed.

KERN COUNTY WATER AGENCY
Bakersfield, California 93302

Director's
Fred L. Stahl
President
J. Elton Fox
Don't Wills
Michael Raton
Robert E. McCarthy
Henry C. Garner
Gene A. Lundquist

Division 1
Division 2
Division 3
Division 4
Division 5
Division 6
Division 7



Telephone (805) 253-6200
Stuart T. Pyle
Engineer-Manager
George E. Hodge
Assistant Engineer-Manager
Pam Schilling
Secretary
Address Mail to
P.O. Box 56
93302-0056

August 13, 1986

Mr. David N. Kennedy, Director
Department of Water Resources
P.O. Box 942836
Sacramento, CA 94236-0001

Dear Mr. Kennedy:

Thank you for the opportunity to comment on the Draft Environmental Impact Report (DEIR) for an Artificial Recharge, Storage and Overdraft Correction Program in the Kern River Fan area, Kern County, California (Kern Water Bank). The Draft EIR and the Agency's comments have been reviewed by the Agency's Ground Water Storage Advisory Committee which is comprised of 17 local public agencies.

The Kern County Water Agency supports the concept of a Kern Water Bank subject to development of a satisfactory agreement with the Department, and looks forward to completion of the feasibility studies as well as construction and operation of the project.

This letter presents our general comments to the DEIR. Additional comments may be transmitted later.

1. The summary to the DEIR (page S-1) states that in-lieu projects in Kern County will be considered as a second part to the Kern Water Bank and will be treated in separate EIRS. While we agree with DWR's method of meeting the requirements of CEQA, the Agency feels that in-lieu storage programs in Kern County should immediately be evaluated by DWR. Local districts now appear to be receptive to the concept, whereas in the past this has not always been the case. The Agency is prepared to participate with DWR to evaluate in-lieu opportunities.

- b. Underlying soils appear to be favorable to high recharge rates.
- c. The area is conveniently located near conveyance canals.
- d. The aquifers in the area are favorable for high capacity wells.

6. Recharge facilities should be located north and south of the City's 2,800 acres to minimize the effect of mounding in the area.
7. We believe it is important to recognize that in very wet years the recharge facilities can be fully utilized with Kern River water and such use should have priority over use of facilities for recharge of imported water.
8. The Kern County Water Agency supports the State's intent to carefully monitor water quality during the recharge process. However, we would like to stress the importance of water quality monitoring under current conditions prior to actual water percolation into the Kern County basin.
The Agency would like to assist the State in arriving at recharge water quality standards (guidelines) suitable for a multi-purpose project such as the Kern Water Bank. Objectives of the guidelines should include, but not be limited to:
 - a. The flexibility to change and/or set standards of recharge water quality. Such future standards will be based on future water quality constituents that may pose potential threats to our State/local supply for both agricultural and domestic uses.

3

In addition, the concept of recharge in areas outside of the proposed project area should be considered in the Program EIR.

2. The DEIR states that for alternative 3 the Kern County Water Agency (Agency) would operate the project under contract with the Department of Water Resources (Department), but does not specify the operator for the proposed project or for Alternative 1 or 2. We strongly believe the Agency should be the project operator for the proposed project for all alternatives evaluated by the Department.
3. Pages 15 and 21 refer to the possibility that water might be extracted before being recharged. We believe that extraction should be limited to water actually recharged or otherwise acquired, less some percentage to provide for operational losses.
4. After reviewing the description of the project alternatives, we believe the preferred project should provide for transfer of the ownership of the project site to the Agency at some later date if such a transfer would improve water and land management in Kern County.
5. Preliminary investigations have indicated the advantages of locating recharge facilities in the upper portion of the Kern River Fan, adjacent to the City of Bakersfield and Rosedale-Rio Bravo Water Storage District lands. Advantages include:
 - a. Lack of continuous underlying clay layers will allow recharge of both confined and unconfined aquifers.

2

- b. The provision that the Kern Water Bank operator may limit the importation of recharge water should it pose a threat to local ground water supplies.
- c. That mutually agreeable limits are to be set prior to recharge operation on such constituents as asbestos, arsenic, calcium, magnesium, potassium, carbonates, nitrates, fluorides, etc.
- d. Regular monitoring of the proposed City of Bakersfield treated waste water effluent disposal site will be initiated by the Department and an agreement for coordinated operation of the disposal site and the Kern Water Bank should be in place prior to construction of SWP facilities.

9. Prior to purchasing the property, the Department will enter into an agreement with KCWA. The agreement should include the following:
 - a. DWR at no time will initiate legal proceedings on actions leading to adjudication of the Kern Ground Water Basin.
 - b. Local water rights and supplies (ground water and surface) associated with the property will not be exported and will remain for the benefit of Kern County.
 - c. Water will be banked in advance of extraction.
 - d. Extraction of water shall not adversely effect ground water levels of adjacent landowners.

4

- e. Land use considerations shall be developed jointly among DWR, KCWA, the County of Kern and City of Bakersfield.
- f. Delivery of SWP supplies for storage shall not create a deficiency of SWP supply otherwise available to KCWA under its Water Supply Contract with DWR.
- g. KCWA to manage, operate and maintain the project at the expense and on behalf of DWR and SWP.
- h. Storage of local waters shall always receive priority over storage of imported waters.

10. Page 2-3

The DEIR suggests that excessive mounding could occur under recharge areas in Alternative 2, but, by omission indicates that similar mounding would not occur for the proposed project as for Alternative 1. It would appear that the mounding would be essentially the same since the same 3,500 acres is being used for recharge. However, if only 3,500 acres were acquired and the surrounding area continued to be used for irrigating agriculture, there could be less mounding than for the proposed project.

Some overdraft correction benefits might be obtained with Alternative 1 if it displaced some irrigated lands.

11. Page 9 - Project objectives, first paragraph

The DEIR states that water would be transported into the recharge basins during "above normal and wet years". This phrase should be expanded to read, "...in above normal and wet years, and when water excess to other State Project needs is

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available However, see comment No. 6 requiring priority for recharge of Kern River runoff in local wet years.

12. Page 12 - Project Facilities, 2nd paragraph.

We would like to reiterate our previous comments made to your Department on the first draft of this DEIR regarding recharge rates and recharge pond size. Historic long-term recharge rates in the vicinity of the project area have been documented at .25 acre-feet per acre per day. This would result in the need for recharge ponds up to 5,400 acres instead of 2,700 acres.

13. Page 14

The Department has based its preliminary studies on the assumed availability of one million acre-feet of usable storage capacity. The DEIR also points out that preliminary estimates indicate that up to 500,000 acre-feet of storage was available in 1983 at depths below 20 feet. It should be recognized that the top of the ground water table must slope away from the recharge areas so that a uniform depth to ground water is probably not realistic. It should also be recognized that the available ground water storage capacity is a significant resource in Kern County that is currently being used by numerous Districts and landowners. This facility is naturally recharged by the Kern River and use by the Department would reduce the available capacity for local regulation. Therefore, we believe there should be a limit to the capacity which can be used by the Department. This limit should be determined based on reasonable estimates of specific yield and analysis over a sufficiently

6

long period to adequately describe hydrologic variations. We look forward to working with the Department during the feasibility study phase of this project to develop a reasonable estimate of such a limit.

14. Page 15 - Project Operations Section, Base Plus Ground Water Study subsection of the DEIR, last paragraph.

We support the statement that Kern River water has first priority for spreading to minimize Kern River Intertie outflow. We recommend that the word "could" be replaced with "should". Note that operating under this criterion may reduce the amount of SWP water for recharge that could occur, especially during 1983 type wet years.

15. Page 15 - Use of Overdraft

It has been our understanding that overdraft eliminated as a result of the project (estimated to be 70,000 AF per year) would be dedicated by DWR as a local Kern County benefit. On page 15 of the DEIR, it reads, "In future studies, some portion of this water may be credited to the SWP and integrated into SWP operations." This statement is inconsistent with our earlier understanding and we therefore suggest it be deleted.

16. Page 16 - Recharge and Extraction Subsection

The comparison of 2,100 acre-feet per year of average annual extractions exceeding recharge to 4,000,000 acre-feet of total accumulation by taking land out of production over the study period is imbalanced. It would be preferable to compare the 2,100 acre-feet to average annual accumulations.

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17. Page 16 - The DEIR suggests that

"...the conceptual ground water storage plan does not attempt to increase the minimum project yield...."

The DEIR should indicate that the method of operating the project has not been determined as yet and that additional plans which increase the minimum project yield, will be developed and analyzed before final selection of the mode of project operation, including their effect on minimum project yield.

18. Page 21 - Operations Section, Extraction Facilities Subsection, 2nd paragraph.

The DEIR states that "some water could be delivered indirectly to adjacent water agencies by ground water outflow from the project area. This water could be pumped by individuals within those agencies." Record keeping for this operation would be extremely difficult since ground water pumpage is not metered in neighboring water districts and a determination of ground water outflow has not been quantified. Before this operating method is applied, methods of measurement should be agreed upon.

19. Page 34

The DEIR explains in detail the variability of ground water quality characteristics of the Kern County basin water. It is further pointed out how difficult it is to qualify and quantify quality changes. Therefore it seems incongruous to use data from 1951 to 1981 based on wells of variable construction, as the basis for the Kriging procedure. The Agency would suggest

8

that water quality maps be based on data from a shorter period such as 1970-79 or 1980-85.

In regard to the apparent lack of an "appropriate data" collection program, it might be of help for the Department to be more specific in the use of the word appropriate. While extensive, detailed information is not available, there is a substantial volume of ground water quality data on hand at KCMA. The Agency has been appointed by the Kern County Board of Supervisors as the Central repository of water quality data. The Department of Water Resources staff is urged to come to the Agency's office to review the volumes of information on file. Agency staff is in the process of organizing water quality data for ease of access by government bodies for such studies as the Kern Water Bank.

20. Page 37 - Geology Section, 3rd paragraph

The DEIR states that "KCMA is testing the "E" clay..." This should be clarified to read that currently KCMA is testing the aquifer in the vicinity of the City of Bakersfield's 2,800 acre recharge site to determine the extent of the hydraulic continuity in sand and gravel deposits imbedded with less permeable silt and clay deposits.

21. Page 39 - Seismicity and related Effects Subsection

Note that the White Wolf fault is located southeast of the project site; not southwest as written.

22. Page 50

The location of the 4,700 acres of lands dedicated to future use

9

as a treated effluent disposal site should be shown on a map to assist in selecting the preferred alternative.

23. Page 56 - Connection to Kern River Channel

The DEIR states that there would be no direct connection between project facilities and the Kern River Channel. We believe a connection should be included in the proposed project to facilitate delivery of SWP water to the site through water exchanges from time to time with Kern River Interests.

Potential exchanges can produce substantial savings for the SWP.

24. Page 58 - Operational Assumption Subsection

KCMA spreading programs in the Berrenda Mesa Spreading Grounds immediately east of the City's 2,800 acres should be included as an additional operational assumption.

25. Pages 58 & 64

The DEIR refers to Scenario III as the basis for estimates of future municipal, industrial and agricultural water use in Kern County. A brief description of the future water uses as compared to present use would be helpful to readers who do not have access to the San Joaquin Valley Ground Water Study Third Progress Report (DWR 1985).

26. Pages 75, 92 and 93 - Property Tax Subsection

To prevent loss of property tax, the DEIR suggests leasing some land for non-irrigated crops, such as wheat or barley. Dry land farming would be very difficult in this area since the average

10

annual precipitation is less than 6 inches. Therefore, this mitigation measure may be inappropriate.

Sincerely,

Stuart T. Pyle
Stuart T. Pyle
Engineer-Manager

11

Commenting Agency: Kern County Water Agency

- Response 1: The Department in cooperation with KCWA has begun the process of developing in-lieu projects. However, completion of pre-feasibility studies on the Tenneco properties will occur before the more detailed in-lieu project analysis.
- Response 2: We are discussing with the City of Bakersfield and others the possibility of the State recharging in areas outside the project area.
- Response 3: The Department will continue to examine these institutional arrangements.
- Response 4: The Department's intent is to withdraw only imported SWP water. Some water resulting from overdraft reduction may be used for land use purposes on the project lands. The contract that will be negotiated between the Department and KCWA shall specify the manner in which the maximum amount of water to be extracted and the maximum rate of extraction from elements of the Kern Water Bank in any one year shall be determined. Water may be extracted only to the extent that it was stored previously. The possibility remains that subject to agreement of all parties, the SWP could purchase water previously stored by other agencies.
- Response 5: The Department will continue to examine these institutional arrangements.
- Response 6: It is the intent of the Department to enter into an agreement with the City of Bakersfield for joint operation of facilities. This proposed coordinated operation with the City will accomplish the advantages referred to in this comment.
- Response 7: Facilities are proposed to be located north and south of the City's 2,800 acre recharge site.
- Response 8: The contract by and between the Department and KCWA shall specify that elements of the Kern Water Bank will minimize any interference with local ground water uses.
- Response 9: Water quality monitoring will begin as soon as possible after land purchase.
- Response 10: This comment raises legal issues that are beyond the scope of the EIR. However, as provided in Section 11258 of the California Water Code, the Department shall enter into a contract for storage and extraction of State Water Project supplies in Kern County with KCWA prior to implementing the Kern Water Bank. The content of the agreement shall be negotiated by and between the Department and KCWA after consulting with the State Water Contractors and KCWA's Ground Water Storage Advisory Committee.
- Response 11: Mounding effects would be the same in alternatives 1, 2, and 3. The intent of the operation studies and design work is to minimize mounding. The overdraft correction benefit obtained from Alternative 1 is about 50,000 acre feet.
- Response 12: See page 17 for change.
- Response 13: While some long-term recharge rates have been as low as 0.25 acre-foot per acre per day, the Department believes that the assumed rate of 0.5 acre-foot per acre per day can be achieved with improved operations and maintenance

procedures. The Department intends to use a range of 0.3 to .05 acre-feet per acre per day.

- Response 14: The Department will work with KCWA to develop reasonable operating criteria.
- Response 15: Same response as Number 14.
- Response 16: This statement (see page 23) has been replaced with, "...and will not be used by the SWP, except that minor amounts may be used for onsite land management activities."
- Response 17: The last sentence in paragraph 2, page 24 has been deleted.
- Response 18: Kern Water Bank shall be operated in the same manner as other SWP conservation facilities and shall be integrated with overall SWP operations under the Rule Curve in effect at the time. See the **Project Operation** section on page 217.
- Response 19: Before this operating method is applied, methods of measurement should be agreed upon.
- Response 20: The data used were sufficient for the EIR. More detailed data will be used in future analysis.
- Response 21: The Department has been made aware of the KCWA's role as the central repository of water quality data in Kern County. As studies proceed, the Department plans to meet with KCWA staff to make maximum effective use of the available data. Future study efforts may require the development of more comprehensive data collection programs.
- Response 22: The statement on page 47 has been changed to reflect the suggested language referenced in this comment.
- Response 23: See page 47 for correction.
- Response 24: See addition to map on page 19.
- Response 25: The coordinated operation of the existing and proposed recharge facilities will provide a connection to the Kern River Channel. Coordinated operation will also result in cost savings.
- Response 26: The expansion of coordinated operation of spreading areas could include the Berrenda Mesa spreading grounds.
- Response 27: The San Joaquin Valley Ground Water Study - Third Progress Report, dated September 1985, analyzes ground water conditions in the Valley. In Scenario III of the report, supplies are modified from year to year to reflect changes in project facility availability, upstream demand reductions in yield, and other factors. CVP and local supplies remain constant with the exception of existing CVP exchange deliveries through the Cross Valley Canal, which are contracted through 1995. In brief, hydrologic projections for the San Joaquin Valley show a continuation of some level of overdraft conditions into the future. The projected long-term overdraft increases from about 1.3 million acre-feet per year in 1985 to over 1.8 million acre-feet per year in 2010. The total cropped acreage for Kern County is projected to decrease from 950,000 in 1985 to 930,000 in 2010.

Response 28: The Department agrees that dry land farming would be difficult in an area where the annual rainfall is on the order of 6 inches. The Department will continue to explore other options to reduce the adverse effects that may result from a lower property tax base during the course of the investigation.



The Metropolitan Water District of Southern California

Office of the General Manager

July 16, 1986

Ms. Delores Brown
California State Department
of Water Resources
Post Office Box 942836
Sacramento, California 94236-0001

Dear Ms. Brown:

Draft Environmental Impact Report - Artificial Recharge,
Storage and Overdraft Correction Program in Kern River
Fish Area (Kern Water Bank)

Metropolitan has reviewed the Kern Water Bank Program Environmental Impact Report (EIR) and appreciates the opportunity to provide comments on the proposed program. Our comments address two general concerns regarding implementation of the Kern Water Bank, three recommendations to expand the water-banking concept to provide additional benefits, and an attachment which provides a specific listing of comments and concerns in the Program EIR.

Average vs. Firm Yield

Metropolitan supports the Department's efforts to evaluate projects which can store surplus Delta flows in wetter years for use in drier years. Studies conducted thus far show that significant increases in State project supply can be realized. The studies also show that the maximum average annual supply and maximum firm yield modes of operation are mutually exclusive, that is, they both cannot be realized at the same time. Some contractors (principally agricultural contractors who are faced with shortages even in average years) seek increased reliability of average annual supplies, while other contractors (principally municipal and industrial) seek the enhancement and protection of firm yield. To provide benefits to all State contractors, careful consideration must be given to the proper balance of Kern Water Bank operating policies to achieve an acceptable level of benefits for all contractors.

1111 Sunset Boulevard Los Angeles, Calif. • Mailing address: Box 54153 Los Angeles, Calif. 90054 • Telephone: (213) 251-6400

The Metropolitan Water District of Southern California

Ms. Delores Brown

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July 16, 1986

Land Purchase

One additional issue of concern is the size of land purchase for the proposed project. It appears that a successful project could still be implemented with purchase of substantially less than the full 46,000 acres. Specifically, lands south of Highway 119 and west of Interstate 5 have no apparent buffer-zone protection for local water districts and overlie a region of lesser recharge capability. These lands represent approximately 65 percent of the 46,000 acres, and their removal from the proposed project would provide a substantial savings in capital costs.

In-Lieu Program

The Kern Water Bank Program EIR briefly addresses the potential for State and locally operated in-lieu programs which could enhance the effectiveness of an overall Kern County groundwater storage and management program. Kern County, which receives supplies from the two major Delta exporters (the State project and federal Central Valley Project), has a large amount of storage capacity in its underlying groundwater basin, and an extensive surface-supply distribution system. Also, recent Department studies have demonstrated that large quantities of unused Delta flows, along with the necessary unused State project conveyance capacity, exists in many years.

An example of such an in-lieu program includes the proposed arrangement with Semitropic Water Storage District. This program appears to have potential as a State project facility; Semitropic has direct access to California Aqueduct water and farmers within the district have an interest in increasing their available surface supply.

In view of the foregoing, Metropolitan recommends that the Department broaden its Program EIR preparation to include greater consideration of State and locally operated in-lieu programs in Kern County. In-lieu programs appear to offer advantages of minimal capital expenditures and the ability to provide farmers with access to additional surface supplies. For the same capital expenditure as the full 46,000 acre Kern Water Bank, a combination of a reduced acreage needed for the Kern Water Bank and a selected number

The Metropolitan Water District of Southern California

Ms. Delores Brown

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July 16, 1986

of additional groundwater management programs might provide significantly greater water supply benefits. As a result, these Kern County in-lieu programs should be evaluated in the Program EIR as part of the overall Groundwater Recharge, Storage and Overdraft Correction Program.

Arvin-Edison/Metropolitan Exchange

Beyond the possible combination of State project groundwater storage programs, DWR should encourage State contractors to store entitlement water as another mechanism for increasing the reliability of water supplies to the contractors. Arrangements of this type, although not envisioned as State project programs, would nevertheless provide increased efficiency in the use of State project supplies.

For example, Metropolitan has been studying the feasibility of an arrangement with Arvin-Edison Water Storage District whereby Metropolitan's State project supplies could be delivered to Arvin-Edison via the Cross Valley Canal and stored in the groundwater basin underlying Arvin-Edison either by spreading or in-lieu deliveries. In dry years when Metropolitan is faced with supply deficiencies, its stored water supply in Arvin-Edison could be delivered by exchange to Southern California. The exchange would consist of Metropolitan's use of Arvin-Edison's Central Valley Project (CVP) supply (up to 128,300 acre-feet) wheeled through the California Aqueduct with Arvin-Edison pumping previously stored water. This program would be subject to the approval of DWR.

CVP Water

One additional element in this package of water supply programs is, in our view, a contract for interim CVP supplies made available in the Delta. There are no new projects more economically attractive than acquiring an interim supply of CVP water. This already developed water, in addition to providing increased firm supplies, can be exported in average and wetter years for delivery to groundwater storage programs. The more water available to store in an array of direct storage and in-lieu programs, the more attractive they become.

This broader package of programs, pursued in concert with implementation of the Kern Water Bank, will provide the necessary increases in State water supply and operational

The Metropolitan Water District of Southern California

Ms. Delores Brown

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July 16, 1986

flexibility to make such programs attractive to all State contractors. In this way, the benefits derived from this array of programs will be commensurate with contractor payments for such programs.

Again, we appreciate the opportunity to comment on the program EIR and look forward to working with DWR in implementing the programs outlined above.

Sincerely,

Myron B. Holburt
Myron B. Holburt
Assistant General Manager

JPH:kw

Attachment

ATTACHMENT

STATE PROJECT KERN WATER BANK EIR
SPECIFIC COMMENTS/CONCERNSI. Land Purchase

- How much is needed for buffer zone; how much provides only environmental or local water supply benefits? 7
- Up to 70,000 acre-feet of overdraft reduction - will the State project get any benefits therefrom? 8
- Kern River water rights associated with full 46,000 acre purchase - will they revert back to Kern-Delta Water District? 9
- What is the estimated cost per acre of the land? 10

II. Local Recharge/Extraction Programs

- To what degree would local programs inhibit the operation of the State project program? 11
 - City of Bakersfield
 - other Kern River interests
 - Rosedale-Rio Bravo Water Storage District
- To what extent will agreements with local agencies be made prior to a land purchase? 12
- Will use of the State project spreading facilities be made available to local agencies? Will there be any compensation for costs incurred? What would be the priority of use? 13
- How will storage and recapture rights be administered in terms of groundwater losses and overlying water rights? 14

III. Integration with SWP Operations

- The EIR should more carefully define firm yield and average delivery operation and cost/acre-foot (EIR generally emphasizes average delivery mode of operation, and is vague on use of terms such as dry-year extraction, dependable supply, increase in State project yield with project, etc.). 15

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- With respect to operation of the Kern Water Bank for maximum firm yield or average annual deliveries, will DWR reevaluate its Rule Curve and include the additional conservation storage provided by the Kern Water Bank? 16
- What would be the Kern Water Bank impacts on wheeling in the State project and related facilities (such as in the Cross Valley Canal)? 17
- Will the EIR expand on the consideration of other Kern County in-lieu programs in combination with proposed project? (Reference: CEQA Guidelines Sections 15165 and 15168) 18
- How much more attractive is the Kern Water Bank with State project access to CVP interim water? 19
- Who receives benefits from selected type of operation - agricultural, municipal and industrial, those requesting less than full entitlement, or those requesting surplus? 20

IV. Project Financing, Repayment, and Related Contract Issues

- What are the project financing and repayment methods contemplated? 21
- What are the proportionate costs of the project to each contractor? 22
- Would the Kern Water Bank be implemented as a "Local Project" under the State Water Service Contracts? If not a "Local Project," a contract amendment would be required to implement the Kern Water Bank as a State Project conservation facility. 23
- Would operation of the Kern Water Bank to maximize average annual deliveries be consistent with the contracts regarding additional conservation facilities to meet the 4.23 million acre-feet of contracted-for supplies? 24

Commenting Agency: The Metropolitan Water District of Southern California

- Response 1: The Department is evaluating a wide range of operational schemes. None has been selected as the way to operate the project, to date. The Department will be consulting with the MWD as operational schemes are developed and evaluated.
- Response 2: The Department is evaluating options for purchasing less than the entire amount of the Tenneco holdings. The permeability of the lands, the need for buffer zones, and other factors are being taken into account. The final selection of lands to be purchased will be based on the results of technical evaluation.
- Response 3: The Program EIR is intended to describe the impacts of acquiring lands on which an artificial recharge project may be designed and operated to store SWP water. Potential programs, such as additional ground water recharge and storage and in-lieu projects are being evaluated and will need to be addressed in subsequent studies that focus on evaluating these alternative means of increasing SWP supply.
- Response 4: This comment raises financial concerns beyond the scope of this EIR. The Department will continue to evaluate financial issues as it further analyzes and refines this project. Additional management areas will be considered in the next phase of study.
- Response 5: This comment raises issues other than environmental. However, proposed programs such as between MWD and Arvin-Edison WSD could be included in the Kern Water Bank concept.
- Response 6: While this comment does not address an environmental issue, the possibility of purchasing CVP water on an interim basis is being pursued independently of this project. The Department agrees that interim water obtained is attractive for storage programs. Such a purchase would provide benefits in addition to those described in this EIR. However, the Department does not regard the purchase as an alternative to this project because the SWP needs the water that would be developed by both activities.
- Response 7: The technical studies will be used to identify areas that may experience significant water level fluctuations and determine the need for buffer zones. Avoiding cost of land severance may require some additional lands which can be used for environmental purposes.
- Response 8: The overdraft reduction which would result from this project will be recognized in the contract negotiations with KCWA.
- Response 9: It is not the intent of the project to acquire rights to local water supplies.
- Response 10: Preliminary costs are being determined by appraisal. The final cost will result from negotiations with the seller.
- Response 11: The Department intends to coordinate its program with the City of Bakersfield and Kern River interests through agreements.
- Response 12: This comment raises a legal issue that is outside the scope of the EIR. However, principles of operation and mitigation will be defined in an agreement with

KCWA. There will be at least a Memorandum of Understanding agreed to between DWR and KCWA before any lands are acquired.

- Response 13: The Department intends to coordinate its operation with the City of Bakersfield and others to recharge each other's water and to adjust costs periodically. Local supplies will have priority.
- Response 14: These issues will be addressed through contracts with the Department, KCWA and possibly other agencies.
- Response 15: Since publication of the Draft EIR, operations studies of a broader scope have been conducted. A comprehensive discussion of the studies will be included in the engineering report.
- Response 16: Rule curves are continually being evaluated. The 1986 rule curve was experimental and a variety of additional rule curves are being investigated. It is intended that the Kern Water Bank will be included in future analyses.
- Response 17: Delivery of State Water Project water to Kern Water Bank would have priority over wheeling for non-SWP purposes. Use of the Cross Valley Canal is subject to negotiations with KCWA.
- Response 18: Subsequent studies will address the various projects that could be implemented on lands acquired from Tenneco. Additional detail will be provided in the technical report.
- Response 19: See response to comment 6.
- Response 20: The primary purpose of the Kern Water Bank is to augment the dependable water supply of the State Water Project. The allocation of water (benefits) will be in accordance with existing contractual provisions between the SWP contractors and the State regarding additional conservation facilities and any contractual amendments that may be necessary. The Department will consult with its contractors regarding methods of operation.
- Response 21: As stated in the Draft EIR (Chapter 13), project financing will most likely be by the sale of long-term revenue bonds. The repayment of costs will be in accordance with existing repayment provisions for additional conservation facilities or with amendments being negotiated for the Water System Revenue Bond amendment.
- Response 22: The Kern Water Bank is considered to be an additional conservation facility which will augment the dependable water supply of the State Water Project. As such, the repayment of costs would be under the repayment provisions of the Delta Water Charge as included in each contractor's water supply contracts. Essentially, each contractor will be responsible for the same proportion of the costs as the proportion of the contractor's Table A entitlement bears to the total Table A entitlement for all SWP contractors.
- Response 23: The Department will be examining a number of ways to characterize the Kern Water Bank under the State water service contracts. Considering the project to be a "local" project is one of those options.

Response 24:

The method of operation of the SWP is still subject to further studies and evaluation by the Department and the SWP water contractors. At this time (December 1986), and as stated in a draft Memorandum of Understanding between the Department and KCWA, the Kern Water Bank shall be operated in the same manner as other SWP conservation facilities and shall be integrated with overall SWP operations under the rule curve in effect at the time. Since a basic concept of the rule curve is that the SWP should be able to meet the current project yield over a seven year dry period, the operation of the Kern Water Bank would be consistent with the contracts.

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NORTH KERN WATER STORAGE DISTRICT

1416 - 18th STREET, ROOM 705
BOX 1186
BAKERSFIELD, CALIFORNIA 93302
PHONE 326-3116

July 15, 1986

Mr. David N. Kennedy, Director
Department of Water Resources
P. O. Box 942836
Sacramento, CA 94236-0001

RE: DEIR "Kern Water Bank"

Dear Mr. Kennedy:

Thank you for providing us with a copy of the DEIR concerning Artificial Recharge, Storage and Overdraft Correction Program in Kern River Fan Area dated May 1986.

North Kern Water Storage District supports the concept of a Kern Water Bank as such a project has the capability of providing a great economic improvement in the State Water Project regulated water supply as well as a means for overdraft correction. Overdraft Correction, in our opinion, is an absolutely necessary adjunct to this project which provides only a minimal offset to those effects upon neighboring areas.

Our general comments are as follow:

1. A number of comments have been made regarding the amount of available storage in the "bank". We call to your attention that even after an unusually wet decade on the Kern (a) and after the import of several hundred of thousand of acre feet of CVP and SWP water to the bank, there still appears to be residual storage capacity of some magnitude throughout the suggested "bank" area. 1

We believe it to be erroneous to suggest locating the replenishment facilities closely adjacent to the City of Bakersfield's existing "2800 acre water storage" project. Conversely, we believe the replenishment facilities should be located in the Enos Lane, Stockdale Highway area and in the Buena Vista Canal Service Area south of Taft Highway. 2

(a) The annual runoff of Kern River as measured at Bakersfield shows years falling within various frequency quartiles.

1st Quartile (extremely dry)	1 year
2nd Quartile (below median)	1 year
3rd Quartile (above median)	3 years
4th Quartile (wet)	5 years

The average for the period was 152.4% of the 92-year normal and the chances of another such decade occurring is less than 3 in 20. The period referred to is 1977-1986.

Mr. David N. Kennedy
July 15, 1986
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2. In-lieu Programs. These programs do not decrease the existing long-term overdraft but they do two other things: 3

a. They provide a broader and improved economic feasibility to the overall program; and

b. They provide a greater and enlarged water storage bank.

In-lieu use is barely mentioned in the DEIR and it should be expanded.

3. Technical input data. We believe there is a need to review the technical data presented within the DEIR as we believe clearly erroneous conclusions as to project requirements would be derived. These relate to replenishment rates and thus extent of facilities and methods of operation which we do not believe are readily or efficiently adapted here. 4

4. We do not believe there has been adequate discussion in the DEIR as to replenishment-storage aspects related to specific replenishment areas and zones of confined groundwater. We are not aware of any substantiated data which verifies that there is a broad, continuous confining clay layer. 5

5. There is no discussion in the DEIR regarding the institutional arrangements which will have to be made with James-Pioneer Improvement District of North Kern Water Storage District. 6

In general, we believe this DEIR is a good "first cut". We are looking forward to progress in your efforts. Please keep us informed.

Very truly yours,

C. H. Williams
C. H. Williams
Engineer-Manager

CHW:ak

cc: Mr. Tom Clark,
Kern County Water Agency
North Kern Board of Directors

Commenting Agency: North Kern Water Storage District

- Response 1: The Department agrees that there is significant storage capacity under the site. The Department will continue to develop elements of the Kern Water Bank program.
- Response 2: The exact location of the Department's facilities in relation to those of the City of Bakersfield will be coordinated with the local agencies and made a part of the technical report.
- Response 3: The Draft EIR is intended to describe the impacts of acquiring lands on which an artificial recharge project may be designed and operated to store SWP water. Potential programs, such as other ground water recharge and storage and in-lieu projects are described in general in the technical report and will need to be addressed in subsequent studies that focus on evaluating these alternative means of increasing SWP supply.
- Response 4: All the technical data are being reviewed and will be evaluated and reported on in the technical report.
- Response 5: This discussion will be included in the technical report.
- Response 6: This comment raises institutional rather than environmental concerns. The Department will be addressing institutional issues with James Pioneer I. D., North Kern WSD, and with KCWA.

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July 14, 1986

Mr. David N. Kennedy, Director
Department of Water Resources
P.O. Box 942836
Sacramento, CA 94236-0001

ATTN: Ms. Delores Brown

Dear Mr. Kennedy:

KERN WATER BANK

This letter is written to present West Kern Water District's general comments concerning the Draft Environmental Impact Report for the Artificial Recharge, Storage and Overdraft Correction Program in the Kern River Fan Area of Kern County, California (Kern Water Bank).

I would first like to take this opportunity to describe in general our District's main responsibilities so that you understand the viewpoints and concerns expressed in the comments contained herein.

The West Kern Water District is located in Western Kern County with a service area of approximately 250 square miles. The District serves exceptionally good quality groundwater to over 25,000 people on the west-side of Kern County. The District provides water service to the City of Taft, the adjacent unincorporated county areas surrounding Taft, the communities of Maricopa, Dustin Acres, Valley Acres, Tupman, Derby Acres, Fellows and McKittrick. In addition to municipal water, West Kern serves industrial water to over 50 oil companies located within its boundaries.

The District contracts with the Department of Water Resources for M&I water through the Kern County Water Agency, our state water contractor. At present, the majority of the M&I water purchased from KCWA by our District is banked by Buena Vista Water Storage District for recovery by this District through exchange agreements.

WEST KERN WATER DISTRICT

Mr. David N. Kennedy, Director
Department of Water Resources

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OPERATION IMPACT (Pages 7, 54 & 55)

It was noted in your report that any possible high or low water levels in adjacent areas during times of recharge or heavy extraction would be mitigated. One mitigating measure for low water levels was to expand surface distribution systems into adjacent districts to deliver surface water in lieu of groundwater pumping. Although this may be effective for agriculturally-related districts, it would not mitigate our District's operations. Another mitigating measure rather than direct delivery was to deepen existing wells if extraction becomes a problem. Who would pay the costs for this measure and the operational losses which might occur as a result of lower pump settings?

During recharge periods, West Kern is concerned about potential water logging in the low lying areas, considering that high groundwater levels can also be expected to occur locally during wet periods. We would recommend that the operational scenarios should address these issues by modeling elements 231, 238, & 224 in your Ground Water Model (GWM). We feel that groundwater level variations will focus upon the need to set more conservative limits on maximum and minimum water levels resulting from recharge and extraction operations.

Another question on operational impacts concerns delivering extracted water to local districts within Kern County during water short years. Is it feasible to deliver to local consumers 30,000 acre feet per month for 12 months straight necessary for the 360,000 acre feet per year project goal to recover recharge water? More likely, it appears that the cyclical nature of the agricultural deliveries would demand peak monthly deliveries during the spring and summer months and reduced deliveries in the fall and winter. Correspondingly, the number of wells necessary to accomplish this measure would have to be increased to deliver the peak flows. In order for these wells to be adequately spaced to reduce interference, well spacing on a larger grid would be needed than would be required without this provision.

One additional operational impact concerns the benefit mentioned of providing a barrier to the movement of poor quality groundwater from the basin periphery into present extraction areas. What would guarantee this from not taking place during this projects extraction operations?

WATER QUALITY (Pages 56 & 57)

It is noted in the DEIR, that the primary use of groundwater in the project is essentially for irrigation. As a result, the DEIR speaks toward protecting the groundwater quality to an irrigation standard. The groundwater our District delivers is for potable use. We do not feel that groundwater degradation decisions can be made based solely upon irrigation use. Our belief is that any degradation in groundwater quality of our water source is problematic.

WEST KERN WATER DISTRICT

Mr. David N. Kennedy, Director
Department of Water Resources

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July 14, 1986

The District's major source of supply to serve its customers comes from a wellfield located in Sections 21 and 28, T30S, R25E, MDB&M. This wellfield is located on the westerly edge of the proposed 46,000 acre acquisition as referenced in the Draft EIR on Page 46.

With these points in mind, the following comments are presented which reflect the District's concerns on items discussed in the Draft Environmental Impact Report.

BENEFIT TO AGRICULTURAL CONTRACTORS (Pages 5-2 & 7)

On both these pages it states, "In times of State Water Project delivery shortages, agricultural contractors will experience the first and largest reductions in deliveries. Conversely, the agricultural contractors will be the principal beneficiaries of new projects (whether surface or groundwater) that increase State Water Project water supply availability." Being an M&I District, it is our belief that if there are additional costs for enhancing the water supply for agricultural customers over M&I customers, we feel that those costs should be borne by those who most directly benefit. We understand that deciding these prorata costs would be in accordance with the State's past water purchase agreements, payments and priorities.

GROUNDWATER OVERDRAFT CORRECTION (Pages 7, 15, 16, 33)

We believe this project may have a positive overall effect on the groundwater overdraft problem in the Kern County Basin. This aspect alone makes it a project worth considering. With the Kern Basin overdrafted by 250,000 to 300,000 acre feet per year, as noted in the DEIR, then correcting this situation by way of water management programs would seem prudent. In proportion to the benefit, the cost of overdraft correction measures should likewise be borne by all benefactors which use the groundwater basin. If the program as described in the DEIR could help to alleviate the basin problems, we would be supportive towards that goal.

The "credit" for overdraft protection of the up to 70,000 acre feet (AF) of water used on the Tennessee Lands by taking these agricultural lands out of production is subject to debate. One argument would focus on what the future may bring to these lands had no project been proposed. We agree with your viewpoint on Page 7 which states, "...given the current financial problems facing agriculture...crop acreages on the Tennessee West Incorporated site are not expected to expand significantly in the near future." An assumption could likewise be made that the crop acreage on these lands may indeed decrease considerably or could be supplied by sources other than groundwater in the future. There is also the real possibility that these lands would be subject in the future to mitigating measures to correct the overdraft in the future that these lands create. We therefore feel that the up to 70,000 AF of water which could be attributed to groundwater overdraft correction may be much less.

WEST KERN WATER DISTRICT

Mr. David N. Kennedy, Director
Department of Water Resources

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July 14, 1986

There is a serious concern that this project will cause degradation of water quality in the Kern River Fan area by recharging State water. Historically, Kern River water, having excellent quality, has been a primary source of recharge in the Kern Fan Groundwater Basin. As a result of this high quality source water the quality of basin groundwater is very good, having a TDS of 150 MGL or less in areas closest to the source of recharge. The TDS of the source water i.e., the State Water Project (SWP) water, exceeds the local surface water TDS and due to the proposed large volumes of SWP to be recharged the current excellent quality of the groundwater will be compromised.

The difference in quality between the Kern River and the State Water Project water (information obtained from Table 4, Page 31, of the DEIR) is shown below.

	TOTAL DISSOLVED SOLIDS, mg/l		
	MIN.	MAX.	AVG.
STATE WATER PROJECT (1980-84)	112	478	218
KERN RIVER (1951-85)	46	187	87
RATIO SWP/KRW	2.4	2.6	2.5

Based on the comparison shown above, we do not agree that the TDS content of the SWP water delivered for recharge is only slightly higher than the groundwater at the project site. The idea that the SWP water once recharged is suitable for agricultural use may be correct. One can not assume that the use of this same water is equally suitable for municipal and industrial purposes.

If groundwater degradation occurs, one mitigating measure was to treat the water. This measure is not necessarily satisfactory to this District. If treatment were the only measure available, who would pay the costs involved in the treatment?

Another concern regarding water quality which was not addressed deals with the affects of wide scale recharge on the possible vertical migration of nitrates, herbicides, and other agricultural chemicals which may have been employed over a number of years on the lands now destined for use as recharge areas. It must also be recognized that in the process of infiltration associated with either artificial or natural recharge, mineral increment will occur in the percolated water. Will these items cause groundwater additional degradation?

WEST KERN WATER DISTRICT

Mr. David N. Kennedy, Director
Department of Water Resources

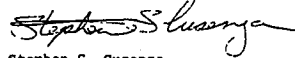
Page 5
July 14, 1986

Because of these water quality concerns, we feel that adequate water quality modeling of the groundwater basin be undertaken to determine the true impact of the proposed program on groundwater quality.

In summary, we would like to state that we are not against the overall concept of the Kern Water Bank in Kern County and adjacent to our wellfield. However, we believe that all the aforementioned environmental concerns need to be addressed prior to a decision to proceed with the program as set forth in the DEIR.

If you should have any questions or need clarification on the items mentioned, please call.

Sincerely yours,



Stephen S. Cusenya
General Manager

SSC/dp

cc: Stuart T. Pyle
Engineer/Manager
K.C.W.A.

Commenting Agency: West Kern Water District

- Response 1: This comment raises financial and legal issues rather than environmental issues. The Department expects that there will be benefits to both agricultural and municipal and industrial contractors. Under the existing State Water service contract, deficiencies are imposed first on agricultural contractors. Agricultural contractors may benefit more often in the near future from the development of additional water supplies. Municipal and industrial contractors will also benefit because the additional supplies will decrease the likelihood or extent of deficiencies being imposed during dry years.
- Response 2: The allocation of costs and benefits of overdraft correction measures will be determined by negotiations between the Department, KCWA, and local agencies.
- Response 3: There are many possible scenarios for future use of the project lands. The Draft EIR assumed that the lands would remain in their current use if not acquired by DWR.
- Response 4: Mitigation measures such as water exchanges, deeping wells, or paying the increased cost of pumping from greater depths may be required. Drilling of additional wells may also be required. The location of ponds and wells may avoid the problem.
- Response 5: This issue will be addressed in the contract with KCWA.
- Response 6: The intent is to operate the project in such a way as to prevent or minimize water logging. If water logging occurs in sensitive areas, appropriate corrective action will be taken.
- Response 7: Sustained amounts of water that can be withdrawn from the basin are being developed in the technical reports. Withdrawals may have to be supplemented by pumpage from the local basin. This will be addressed further in the technical report.
- Response 8: With SWP project operation water levels will be, except for very limited periods, higher than they would be in the absence of the project. These higher water levels will inhibit the movement of poor quality water.
- Response 9: The water delivered to storage would meet M&I water quality needs, as would that extracted by the project.
- Response 10: A small increase in TDS is anticipated but it is expected that ground water quality will remain suitable for M&I and agricultural use where this is presently the case. The quality of SWP water is generally comparable to local ground water quality.
- Response 11: The mineral quality of SWP water is comparable to local mineral quality and within the standards for both municipal and industrial and agricultural use.
- Response 12: We do not expect this program to cause degradation to the extent that treatment would be required. If mitigation is necessary, the SWP would pay for those adverse effects caused by project operation. Mitigation measures would be included in the contract with KCWA.

Response 13: Existing data does not indicate that agricultural chemicals have leached into the ground water table. Further investigations will be conducted once a specific project is identified. In any event this could occur in the absence of a State project. Taking land out of production will eliminate the possibility of future use of agricultural chemicals reaching ground water on project lands.

BOARD OF DIRECTORS
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Vice-President
RICHARD CARABARRA
BOBBY FLETCHER
STEPHEN STERNHOFFER



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STEPHEN S. CUSENZA
General Manager
Bakersfield
MARJANET MOLLOUGH
Auditor

WEST KERN WATER DISTRICT
Department of Water Resources

July 30, 1986
Page Two

July 30, 1986

Department of Water Resources
P.O. Box 942836
Sacramento, CA 94236-0001

Gentlemen:

**RE: SUPPLEMENTAL DEIR
KERN WATER BANK PROJECT**

As you are aware, the West Kern Water District currently leases from Tenneco West, Inc. approximately 480 acres located within the Project area. Said property is described in a document entitled "Modification of Indenture and Agreement", dated October 18, 1962, and a further document entitled "1966 Amendment of Indenture", dated September 15, 1966.

This District (and/or its predecessors-in-interest) has utilized most of said property since the 1920s for the purpose of providing domestic water service to the City of Taft and surrounding environs. Since the 1960s, this District has also utilized said property for the recovery of water purchased by the District and banked for recovery within the Southern San Joaquin Valley Groundwater Basin. Said banked water is recovered via District-owned and operated wells and is distributed through District-owned and operated works and facilities.

The above-mentioned agreements between this District and Tenneco West, Inc. will expire on or about December 31, 1990. Rather than renegotiate said Agreement for an additional lease term (requiring the continued payment of rent) this District has for several years contemplated the acquisition of the wellfield property by negotiated purchase and/or exercise of the District's power of eminent domain. Because of our desire to protect this District's source of supply, we do not favor State or Kern County Water Agency ownership of that portion of the Project area leased by District. Accordingly, we request that the lands described in Exhibit "A" (which is attached hereto and incorporated herein by this reference)

be excluded from the Project. In addition, we would request an easement for pipeline purposes to connect the northwest quarter of Section 22 with the southeast quarter of Section 21 since the District has an interest in the former as well as the latter.

As an alternative to the foregoing, we request that the project be redesigned in such fashion as will provide for the ultimate acquisition of the property mentioned in Exhibit "A" by this District. Our acquisition of the subject property may be directly from Tenneco West, Inc. or from their purchaser if necessary, but must be guarantee.

Finally, and in addition to the foregoing, this District is interested in acquiring additional lands for the purpose of spreading water within the vicinity of District's well field. Exhibit "B" represents the lands deemed necessary for this purpose. We would request that the same also be excluded from the Project and/or acquisition by the District be made a part of the Project.

Thank you for your cooperation and consideration.

Very truly yours,

Stephen S. Cusenza
Stephen S. Cusenza
General Manager

SSC/dp

Enclosures

cc: Mr. Gene R. McMurtrey
2001 22nd Street, Suite 100
Bakersfield, CA 93301

Mr. Bill Balch, Executive Vice-President
Tenneco West, Inc.
P.O. Box 9380
Bakersfield, CA 93389-9380

Mr. Tom Clark, Assistant Manager
Kern County Water Agency
P.O. Box 58
Bakersfield, CA 93302

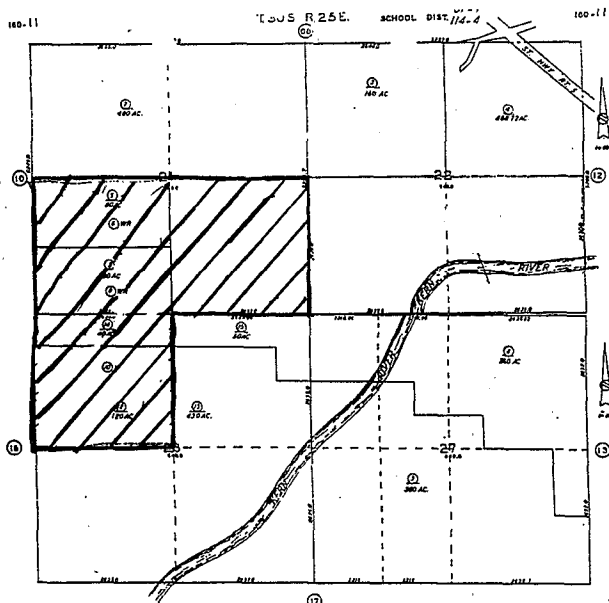


EXHIBIT A

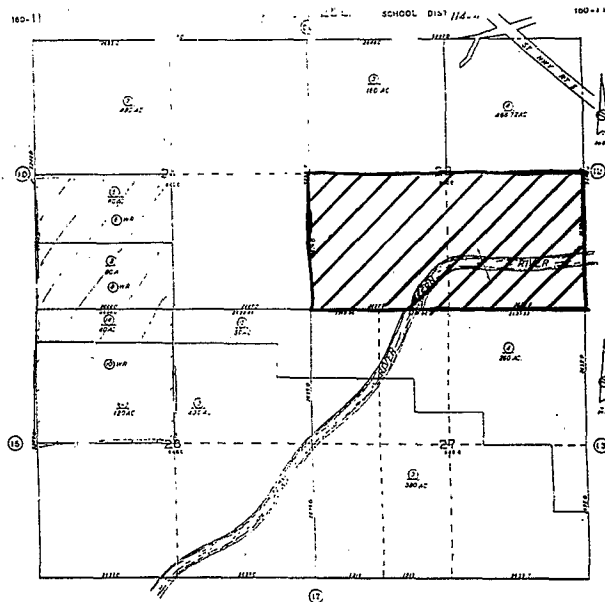


EXHIBIT B

Commenting Agency: West Kern Water District

- Response 1: The Department does not object to West Kern WD acquiring these lands independently. The Department will continue to consult with affected agencies as it develops specific plans for the project.
- Response 2: The Department will continue to consult with all affected agencies as specific plans for the project are developed.
- Response 3: Same as response 2.
- Response 4: Same as response 2.

**Tenneco Oil
Exploration and Production**
A Tenneco Company

10000 Ming Avenue
P.O. Box 9909
Bakersfield, California 93399
(805) 835-6700



Pacific Coast Division

July 15, 1986

FEDERAL EXPRESS
#823569084

Ms. Delores Brown
California Department of Water Resources
1416 Ninth Street
Sacramento, CA 95814

Re: Comments on the Draft Environmental Impact
Report for the Kern Water Bank (SCH#86031710)

Dear Ms. Brown:

Tenneco Oil Company has reviewed the subject Draft Environmental Impact Report (DEIR) and submits herewith our comments on the proposed Kern Water Bank Project.

For your information Tenneco Oil Company (Tenneco) is an affiliated company of Tenneco, Inc. (as is Tenneco West, Inc.) and is charged with the responsibility of managing and developing the mineral resources of the parent company. Such oil and mineral resources include those now being produced within the project area as well as any and all minerals that may be discovered in the project area in the future.

We support the Department's proposed action as evaluated in the DEIR. The proposed project is superior to the five alternatives identified to meet the objectives of providing additional storage for the State Water Project; reducing overdraft in Kern County; and enhancing wildlife habitat. However, we believe that the DEIR should be supplemented and amended in specific areas as identified below to address more completely the importance of existing and future oil and mineral resources in the project area, and to discuss further their role in relation to the mitigation measures proposed. Our specific comments on the DEIR are presented below and are organized in order of the affected page of the document.

Page 42 - GENERAL ENVIRONMENTAL SETTING - WILDLIFE

Tenneco believes that the Final EIR should further address and recognize the scope and importance of oil and gas development in the proposed project area. The existence of oil and gas development within the proposed area of acquisition is especially relevant because it has historically resulted in the creation or maintenance of large areas of relatively undisturbed natural vegetation and wildlife habitat. Oil and gas exploration and production operations of the type found in the project area, are among the least intensive land uses common to this area of the San Joaquin Valley and can consequently serve as a compatible adjunct to wildlife mitigation.

**Tenneco Oil
Exploration and Production**

Ms. Delores Brown

-3-

July 15, 1986

lives of these fields have permitted their continued production. Future developments in advanced production technologies are expected to extend the lives of these existing fields, and could also affect new discoveries.

Tenneco believes that oil and gas operations must be considered in the land planning aspects of the proposed project. Although the surface impact of oil and gas operations is minimal, the economic impact of these operations is significant.

Page 73 - OIL AND MINERAL RESOURCES - MITIGATION

Given the nature and extent of oil and gas operations in and around the project area, Tenneco is concerned with the Department's proposal that the mitigation measures for oil and mineral resources involve the identification of lands having oil and mineral potential as a requisite to negotiation for the land acquisition. Identification of "those lands having the greatest oil and mineral potential" in the project area cannot practically be done given the extent of exploration data available at this time, nor could such identification be done so as to anticipate new technological developments.

Based on the historical experience of existing oil and gas operations in the project area, the environmental impact of similar future operations is expected to be insignificant in relation to the associated land uses of interest to the project. Also, any adverse impact on future wildlife habitat would be greatly outweighed by the overall beneficial improvement of the existing wildlife habitat from the implementation of the entire project.

As a result, Tenneco recommends that the Department amend the proposed mitigation measure in the DEIR to provide for joint use of lands where appropriate. For example, on page 71 of the DEIR, it is indicated that "attempts will be made to accommodate wildlife needs without impacting agricultural production in adjacent areas." This philosophy is also appropriate and should be applied to oil and gas exploration and production operations in the project area.

Tenneco hereby requests that the above comments be considered and included in the final Environmental Impact Report for the Kern Water Bank Project. Addressing existing and future oil and gas operations in the project area will provide a more complete analysis of the environmental consequences of the project, and will strengthen the Program EIR as a reference for future project activities.

Very truly yours,

H. M. Korell
H. M. Korell
Division Production Manager
Tenneco Oil Company

MLE/FJB/HMK:m1
1455F

**Tenneco Oil
Exploration and Production**

Ms. Delores Brown

-2-

July 15, 1986

Accordingly, we recommend that the Department add a new section under Wildlife entitled "Oilfield Habitat" to address the unique habitat characteristics of project lands now used for oil exploration and production facilities. An understanding of the character of habitat associated with oil and gas operations is important to the development of appropriate and effective wildlife mitigation measures.

Page 43 - GENERAL ENVIRONMENTAL SETTING - OIL AND MINERAL RESOURCES

Tenneco understands that the Department has prepared this environmental document as a program EIR and that the State CEQA Guidelines recommend some limitations on the page length of such reports. However, we believe that the oil and mineral resources discussion should be amplified in the Final EIR to address the importance and scope of oil and gas operations within the project area.

Historically, the five oil fields of significant size in the project area have produced large volumes of hydrocarbons and will continue to produce significant volumes in the future. Table 1 provides a summary of the past production, estimated remaining reserves, and production technologies of each of these oil fields. The past production of hydrocarbons from these fields has had a significant economic impact, not only to the operators and owners of the oil and gas production, but to Kern County, and the State of California as well. It is anticipated that this favorable economic impact will continue in the future.

Table 2 is provided to demonstrate the surface impact of current oil and gas operations within the five producing fields in the project area. As can be seen from this table, the land disturbance associated with oil and gas exploration and production operations comprises a very small percentage of the land devoted to mineral development. For the five fields located within the study area this disturbance is estimated to average 7 percent of the total oil field area.

The economic feasibility of oil and gas extraction is greatly influenced by new developments in production technology in addition to conditions of supply and demand. For this reason, it should be recognized that extensive constraints on surface access or operations in this producing area could severely impact the future ability to develop existing or newly discovered reserves. This point is illustrated by considering the productive lives and past operations of the five oil fields in the study area. Each of the five fields of interest in the DEIR was discovered in the late 1930's with the oldest discovery being the Ten Section Field in 1936. Secondary recovery technologies developed throughout the

TABLE 1
TABLE OF OIL AND GAS PRODUCTION
IN THE PROJECT AREA

FIELD	DISCOVERY DATE	PRODUCTION TYPE	1-----RESERVES-----		4CURRENT PRODUCTION			REMAINING LIFE (YRS)	2COMMENTS
			ORIGINAL (MGB)	REMAINING (MGB)	OIL (BPD)	WATER (BPD)	GAS (MCFD)		
Strand	1939	Oil & Gas	25,040	355	135	180	628	Unknown	Waterflood 1974-1983
Canal	1937	Oil & Gas	30,437	174	31	450	18	Unknown	Gas Injection 1941-1959 Waterflood 1958-1982
Ten Section	1936	Oil & Gas	112,543	548	400	2,910	1,223	Unknown	Gas Injection 1954-1956 Gas Cycling 1959-1975 Waterflood 1961-1971
N. Coles Levee	1939	Oil & Gas	246,895	3,338	1,605	9,815	1,968	Unknown	Waterflood 1954-Present CO2 Flood 1981-Present
S. Coles Levee	1938	Oil & Gas	154,138	37,231	934	1,777	6,687	Unknown	Waterflood 1976-Present
TOTAL			569,053	41,645	3,105	15,132	10,524		

NOTES:

MGB - Thousand Gross Equivalent Barrels
BPD - Barrels Per Day
MCFD - Thousand Cubic Feet Per Day

REFERENCES

- ¹20th Annual Report of the State Oil & Gas Supervisors-1984 (Calif. Dept. of Conservation, Division of Oil & Gas)
- ²California Oil & Gas Fields, Volume 1 (California Division of Oil & Gas)
- ³Annual Review of California Oil and Gas Production-1984 (Conservation Committee of California Oil Producers)
- ⁴The California Production Record-December, 1985 (Conservation Committee of California Oil Producers)

TABLE 2
SURFACE IMPACT OF OIL AND GAS OPERATIONS
IN THE PROJECT AREA

FIELD	TYPE OF PRODUCTION	2AREA OF OIL FIELD (acres)	1,3,4TOTAL NO OF WELLS	ESTIMATED AREA OF WELL PADS (acres)	ESTIMATED AREA OF ASSOCIATED FACILITIES (acres)	ESTIMATED AREA OF ROADS AND PIPELINES (acres)	ESTIMATED TOTAL DISTURBED AREA (acres)	PERCENT DISTURBANCE (decimal)
Strand	Oil & Gas	1,290	63	18.3	2.5	63	83.8	0.06
Canal	Oil & Gas	780	41	11.9	.9	41	53.8	0.07
Ten Section	Oil & Gas	2,430	157	45.5	11.1	157	213.6	0.09
N. Coles Levee	Oil & Gas	3,690	203	58.9	14.1	203	276.0	0.07
S. Coles Levee	Oil & Gas	3,340	87	25.2	11.6	87	123.8	0.04
Totals		11,530	551	159.8	40.2	551	751.0	0.07

REFERENCES

- ¹20th Annual Report of the State Oil & Gas Supervisors-1984 (Calif. Dept. of Conservation, Division of Oil & Gas)
- ²California Oil & Gas Fields, Volume 1 (California Division of Oil & Gas)
- ³Annual Review of California Oil and Gas Production-1984 (Conservation Committee of California Oil Producers)
- ⁴The California Production Record-December, 1985 (Conservation Committee of California Oil Producers)

Commenting Agency: Tenneco Oil Exploration

- Response 1: The Draft EIR adequately addresses the importance of oil and gas development within the project area. Table 4a has been added to the **Oil and Mineral Resources** section to show 1985 production in the area.
- Response 2: Based on field examination by the Department's staff, it is not believed that the condition of lands in the oil production areas provide as favorable of wildlife habitat as your comment suggests.
- Response 3: The Draft EIR recognized that the oil and gas operations will continue to be a part of the environment in the project areas.
- Response 4: The Department intends to allow reasonable surface access for oil exploration and production activities. The available petroleum industry technology and the limited areas of incompatible land use will permit exploration and production activities.
- Response 5: This provision has been deleted from the Draft EIR, page 83. Mitigation will be spelled out in the deed restrictions.
- Response 6: Proper coordination of Tenneco future operations with our project will ensure that adverse impacts are minimized.
- Response 7: The Department is not sure of what kind of joint use Tenneco wants. Careful advance planning will need to be done in order to minimize adverse impacts. The Department will coordinate its activities with Tenneco to minimize impacts on the oil and gas operations.

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WHEELER RIDGE-MARICOPA WATER STORAGE DISTRICT

MARICOPA HIGHWAY AND CALIFORNIA AQUEDUCT
8 MILES WEST OF METTLER

ARNOLD S. RUMMELSBURG
ENGINEER-MANAGER
WILLIAM A. TALBIE
ASST. ENGINEER-MANAGER

TELEPHONE (805) 858-2281
MAILING ADDRESS
P.O. BOX 9423
BAKERSFIELD, CA 93380-9423

July 14, 1986

Mr. David Kennedy, Director
Department of Water Resources
Post Office Box 94236
Sacramento, CA 94236-0001

Re: Draft EIR - Kern River Fan Ground Water Program

Dear Mr. Kennedy:

We take this means to follow-up on the remarks presented at the June 25th hearing on the Draft EIR for the Kern River Fan Ground Water Program.

As stated at that time, we believe the draft report to be very well done with respect to covering the various environmental issues which must be considered, and we wish to commend your staff for completing this work with the short time frame involved.

If we have any criticism it would be that the discussion of the "no project alternative" is too limited. You need not be told of the requirements for increasing the yield of the State Water Project from its present level. We need not be told the areas which would most suffer if this is not done, at least under the present allocation procedures. Thus, we believe that the environmental affects of a shortage in the State Water Project Service Area should be considered.

Please be assured that this District supports the concept of the proposed program as a means of increasing the yield of the State Water Project.

Very truly yours,


Arnold S. Rummelsburg
Engineer-Manager

ASR:llh

Commenting Agency: Wheeler Ridge-Maricopa Water Storage District

Response 1: The following statements were added to the No Project discussion on page 96. "Although the effects of any one facility (such as the Tenneco land purchase) may be limited in the service areas, cumulatively, the SWP could have a major impact upon the State. Similarly, substantial detrimental effects will be incurred if the present capacity of the SWP (about 2.3 million acre-feet) is not increased to the contractual yield of about 4.2 million acre-feet by year 2020. If the SWP is not completed by 2020, the State could lose \$10.5 billion annually in primary income during average hydrologic years. During a dry year, the loss of primary income would increase to \$14.4 billion. The resulting annual loss of primary employment during an average hydrologic year would be about 286,000 person years. During a dry year, the primary employment loss would be about 390,000 person years (Ca. Department of Water Resources, 1985)."

TULARE LAKE BASIN WATER STORAGE DISTRICT

ESTABLISHED 1926
1109 WHITLEY AVENUE • PHONE (209) 992-4127
CORCORAN, CALIFORNIA 93212

July 14, 1986

Delores Brown
Department of Water Resources
P.O. Box 942836
Sacramento, Calif. 94236-0001

Re: Draft EIR-Kern Water
Bank Program

Dear Ms. Brown:

As I stated before the hearing on June 25, 1986, this District supports the concept of storing State Project Water in ground-water basins in Kern County, for later extraction.

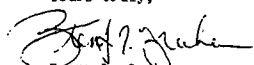
Some additional comments are presented here for the record.

Alternative 1. proposes acquiring 30,000 acres of land which includes 3,500 acres of percolation basins. We question the need for acquiring such large acreage, even with the need for facilities and pumps to bring water to the ponds and extract and deliver water to the Aqueduct. 1

Alternative 3. proposes to have the Kern County Water Agency purchase and operate the ground water storage project. We do not believe this would be in the best interests of the State Water Contractors. Since the State currently owns and operates all of the SWP facilities, this practice should continue on any future facilities. 2

Thank you for the opportunity to comment.

Yours truly,


Brent L. Graham
Manager

BLG:lj

• COMPRISING TULARE LAKE BASIN IN KINGS AND TULARE COUNTIES, CALIFORNIA •

Commenting Agency: Tulare Lake Basin Water Storage District

- Response 1: The amount of land required to operate an effective ground water program will be based on the results of the technical studies.
- Response 2: Contracts between the Department and KCWA would provide for initial purchase of the land by KCWA or for purchase from the Department at a later date (e.g. up to 10 years). Such a transfer would make the project more acceptable to Kern County interests and would improve water and land management in the area.

BUENA VISTA WATER STORAGE DISTRICT

1400 EASTON DRIVE - SUITE 100 A

P.O. BOX 18478

BAKERSFIELD, CALIFORNIA 93309

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Bakersfield, CA 93306
Phone (805) 764-5510

HAROLD K. RUSSELL
District Manager
BETTY HARDEN
Asst. Dist. Mgr.

July 14, 1986

Mr. David N. Kennedy, Director
Department of Water Resources
P.O. Box 942836
Sacramento, Ca 94236-0001

Re: Artificial Recharge, Storage and Overdraft Correction
Program in Kern River Fan Area, Kern County, California
(Kern Water Bank); Comments on Draft Environmental Impact
Report

Dear Mr. Kennedy:

We appreciate the opportunity to review and comment on the Draft EIR on the proposed "Kern Water Bank." Due to the various water resources in Kern County, each District will view this project from their particular perspective. Buena Vista is somewhat unique in that our water supply is comprised of Kern River water, State Aqueduct water and groundwater. We therefore must look at this project from all perspectives to properly evaluate its impact on our District. We will first comment on specific issues within the Draft EIR and then present our comments on other issues that concern Buena Vista.

Local control, operation and ownership of the project would be beneficial to the County and would make the project a more acceptable one. We feel the Kern River Fan ground water basin is an extremely valuable resource and the use of such a resource by an outside interest should come at some cost. In this regard, local benefits accruing from the project at low incremental cost are very important and necessary. These benefits should include priority of use by Kern River interests in wet years, groundwater overdraft correction by taking lands out of production and Agency contract guidelines which preserve adequate ground water storage space for local use.

Assuming that this project moves ahead with the purchase of all or a portion of the Tenneco lands, we will next address the method of operation. It should not be assumed that any negative imbalance of recharge vs extractions developed by studies is acceptable to Kern County. Planned operations should be on the safe side and any G.O.C. benefit from taking land out of production is a benefit that should not be infringed on. We also would question the amount of overdraft correction

Mr. David N. Kennedy
July 14, 1986
Page 2

benefits realized by taking lands out of production. As the DEIR points out, much of the water used historically to irrigate Tenneco lands was surface water and a considerable portion of these lands may not economically support a future farming endeavor with the present and anticipated agricultural economy. We feel that extractions should be limited to water actually recharged less some percentage for operational losses, say 10 percent, which would fluctuate up or down as monitoring programs may dictate. A groundwater basin has no set parameters and the only model that works is the real thing. Therefore, it is of utmost importance that there be flexibility built into the operation guidelines. Such things as proper limitations on available project groundwater storage space, the location of recharge ponds vs extraction wells and a monitoring program are critical to local acceptance of the project.

We wish to emphasize the importance of G.O.C. being a part of the program and a benefit that should be adequately addressed as this program could inhibit Kern County's ability to solve said problem in the future. Since the Buena Vista District lies adjacent to or in proximity to the project area and is a groundwater user, we continue to have concerns that are not addressed by the land acquisition EIR. As indicated, additional studies and specific features need to be addressed that we feel will require an additional study and an EIR.

Listed briefly below are a few additional thoughts and comments on our part:

(a) The Projects proposed magnitude warrants some fears as to unknown effects what with 100+ wells and 300,000+ acre feet, (equivalent to irrigating some 100,000 acres) being extracted in one year. Could a smaller Project be considered as an additional alternative?

(b) How will the cost of the project effect local Kern County Water Agency member units future State water costs?

(c) What will be the physical effects on Buena Vista, which might include our groundwater recharge activities, existing and planned groundwater banking and recovery programs, existing facilities, the groundwater recharge Buena Vista has historically received from the area, etc?

(d) What is the potential for an in-lieu program involving Buena Vista?

Mr. David N. Kennedy
July 14, 1986
Page 3

Generally speaking, we agree with the Kern County Water Agency's reply to the Draft EIR and thus did not repeat their comments in this correspondence. We do feel it necessary to advise you of important concerns that we have due to our involvement in the Kern River and the groundwater basin.

Yours very truly,
BUENA VISTA WATER STORAGE DISTRICT

H.K. Russell
H. K. Russell
Engineer-Manager

HKR:bh

Commenting Agency: Buena Vista Water Storage District

- Response 1: This comment raises institutional rather than environmental issues. These, as well as other issues, will be addressed in our contract with KCWA.
- Response 2: The Department agrees it is prudent to operate the project safely. The allocation of water derived from removing land from irrigation will be negotiated between the Department, KCWA, and local agencies.
- Response 3: The Department's intent is to withdraw only imported SWP water. The contract that will be negotiated between the Department and KCWA shall specify the manner in which the maximum amount of water to be extracted and the maximum rate of extraction from elements of the Kern Water Bank in any one year shall be determined. Water may be extracted only to the extent that it was stored previously. The possibility remains that subject to agreement of all parties, the SWP could purchase water previously stored by other agencies.
- Response 4: DWR intends to do further environmental evaluation with each major step toward implementing the Kern Water Bank to determine whether that step would cause significant environmental effects beyond those analyzed in the EIR. If it appears that new significant effects would occur, additional EIRs or supplemental EIRs will be prepared. The on-going technical studies will assist DWR in making the evaluations. Development of a better model during the feasibility study will improve knowledge of possible impacts.
- Response 5: The size of the proposed project will be limited by the "technical evaluation of adverse effects and will be designed to avoid as many adverse effects as possible.
- Response 6: The cost, as estimated in the Draft EIR, would be recovered from the SWP contractors as a conservation facility cost; estimated to be \$3.00 to \$3.50 per acre-foot on each contractor's Table A entitlement amount. As a SWP contractor, KCWA would be charged the direct SWP charges. KCWA would then be responsible for determining the cost to their member units.
- Response 7: The Department does not intend to do anything that would restrict existing ground water programs.
- Response 8: All potential in-lieu programs will be evaluated under the next phase. Local agencies have been asked to submit potential in lieu programs for examination by the Department and KCWA.



ROSEDALE - RIO BRAVO

WATER STORAGE DISTRICT

849 Allen Road • P.O. Box 867 • Bakersfield, California 93302-0667 • 569-6045

Mr. David H. Kennedy, Director
Department of Water Resources
P.O. Box 942836
Sacramento, CA 94236-0001

July 14, 1986

Attention Ms. Delores Brown
Draft Environmental Impact Report (DEIR)
Kern Water Bank

This letter is written to present some of the comments that Rosedale-Rio Bravo Water Storage District has relative to the Kern Water Bank Program DEIR. On several occasions our staff and directors have met with you and your staff relative to the proposed Kern Water Bank Program DEIR and the impact of the proposed program on the District, its landowners and its project. Because the DEIR is on a proposed "program" and not a specific project the impacts cannot be defined and likewise we cannot determine if they will be significant and adverse to our interests.

The DEIR for the Kern Water Bank Program indicates that any project that is constructed and operated as part of the program will have minimum interference with recharge facilities of other agencies. We presume that this includes Rosedale's recharge project and its operation. Rosedale has participated with other Kern County entities in providing input to the Kern County Water Agency in its response to the DEIR, therefore we will not repeat those comments here. We are not fully in agreement with all of the comments of the KCWA, however, they have covered the majority of the items about which we are concerned and which we believe must be addressed before this program can proceed to a operational project. As we have attempted to relate to you and your staff, we are very concerned that the "buffer area" is not adequate to keep the Kern Water Bank from having an adverse impact on Rosedale's project and landowners. The detailed location and operation of the project recharge and extraction facilities are not part of the program DEIR so the impact on the District has not and cannot be determined until the Kern Water Bank project facilities and their operations are defined. The Kern Water Bank Program must not interfere with existing programs here in Kern County where we still have an overdraft and irregular supplies do exist that can and must be used to offset that overdraft by recharging the groundwater basin.

Department of Water Resources

2

July 14, 1986

We thank you for the opportunity to comment upon the DEIR on the Kern Water Bank Program. We are confident that the final project that is implemented by the Department of Water Resources will be one that benefits areas as well as the State Water Project. We look forward to working with the Department of Water Resources in resolving adverse impacts on local entities and seeing a beneficial and safe project implemented.

Very truly yours,

ROSEDALE-RIO BRAVO WATER STORAGE DISTRICT

Mary E. Collup
Mary E. Collup
Manager

sgm

cc: Bill Palmer
David Hardan
RRBWD Board of Directors
KCWA

BK-R01-002-86

Commenting Agency: Rosedale-Rio Bravo Water Storage District

- Response 1: SWP operations will attempt to minimize adverse affects on other agencies including Rosedale-Rio Bravo Water Storage District. Operational changes or mitigation will be provided for any adverse effects that do occur.
- Response 2: Impacts in the Rosedale-Rio Bravo WSD are being considered. Mitigation measures will be determined.
- Response 3: The presence of Kern Water Bank facilities should increase the capability of using the irregular local supplies in the area. An operational objective for State operation will be to avoid waste of local water.

HENRY MILLER WATER DISTRICT

POST OFFICE BOX 8750
BAKERSFIELD, CALIFORNIA 93308
TELEPHONE (805) 327-3551

BOARD OF DIRECTORS
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LARRY J. CHIRICO
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JOSEPH E. VANDON

July 14, 1986

PAUL T. MACHT
Treasurer
THOMAS R. HURLBUTT
Manager
OWEN F. GOODMAN
Secretary

Department of Water Resources
Post Office Box 942836
Sacramento, California 94236-0001

Attention: Delores Brown

RE: Draft Environmental Impact Report - Kern Water Bank

Dear Ms. Brown:

The following comments on the above referenced Draft EIR are submitted for your consideration and review on behalf of Henry Miller Water District.

There are several references in the DEIR to the potential reduction in groundwater pumping which would result from removing the land in question from irrigated agriculture. The amount of reduced pumping is apparently proposed to be dedicated to the local basin, although there is mention of the possibility of somehow utilizing a portion of such reduction for project purposes, i.e. export from the area. It should be noted that some portion of the current groundwater pumping in the area is actual overdraft which could not be exported from the basin. The balance of the current pumping should be dedicated to the local basin to mitigate for project impacts. 1

There are ambiguous statements in the DEIR related to the potential for the project to withdraw more water than has been recharged. The Final EIR should clearly state that no water will ever be pumped by the project that has not already been recharged and is not still available for recovery. 2

In order to determine the amounts of water described above, a methodology should be developed to quantify the actual net recharge which will occur. Assumptions or gross estimates should not be utilized. Similarly, a method of tracking the subsurface movement of recharged water, such as proposed in the DEIR, should be developed and used. 3

The section titled "Related Projects" on pages 45 and 46 should make specific reference to Henry Miller Water District's on-going purchase of supplemental water

Department of Water Resources
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from the Kern County Water Agency. These supplies have been purchased by the District whenever available, and have been used for in-lieu groundwater recharge. The potential for the proposed project to adversely impact the District's on-going program should be identified.

The Draft EIR states that the potential exists for project groundwater pumping to create drawdowns which may exceed levels which could be expected to occur under "without project" conditions. The occurrence and magnitude of any increased drawdowns should be as limited as possible. In the years when such an event would be likely to occur, it is also likely that local surface water supplies would be severely limited, so that surrounding pumpers would also rely heavily on groundwater. At those times, any increased costs associated with lower groundwater pumping levels experienced by those pumpers may be the so-called straw to break the camel's back. 4

In conclusion, we feel the proposed project has the potential for adding an additional increment of yield to the State Water Project at an affordable, competitive cost. Consideration must be given, however, to avoiding and/or mitigating potential adverse impacts to those with existing groundwater programs adjacent to the project area.

Very truly yours,
HENRY MILLER WATER DISTRICT
Thomas R. Hurlbutt
Thomas R. Hurlbutt

TRH:bm

cc: Kern County Water Agency
David C. Cosyns

Commenting Agency: Henry Miller Water District

- Response 1: The overdraft reduction that would result from this project will be recognized in the contract negotiations with KCWA. Some pumpage may be dedicated to environmental uses. The actual allocation of water derived from removing land from irrigation will be negotiated between the Department and KCWA.
- Response 2: The Department's intent is to withdraw only imported SWP water. The contract that will be negotiated between the Department and KCWA shall specify the manner in which the maximum amount of water to be extracted and the maximum rate of extraction from elements of the Kern Water Bank in any one year shall be determined. Water may be extracted only to the extent that it was stored previously. The possibility remains that subject to agreement of all parties, the SWP could purchase water previously stored by other agencies.
- Response 3: A SWP storage program would increase the amount of water available to KCWA. KCWA could in turn choose to maintain or increase its sale of supplemental water to Henry Miller Water District.
- Response 4: Comment noted. We will attempt to limit drawdowns to the extent possible. Local users will benefit from the lower pumping costs which result from higher ground water levels.

CITY OF
BAKERSFIELD CALIFORNIA

COMMUNITY SERVICES DEPARTMENT

PAUL DOW, Manager
GENE BOGART, Director of Water Resources
FLORIN CORE, Assistant Director of Water Resources
FRANK FALSBY, Parks Superintendent, 326-3781
JIM LEDOUX, Recreation Superintendent, 326-3701
ROBERT HART, Sanitation Superintendent, 326-3781



July 14, 1986

Ms. Delores Brown
Department of Water Resources
P. O. Box 942836
Sacramento, CA 94236-0001

RE: Kern Water Bank; Response to Draft E.I.R.

Dear Ms. Brown:

As noted in our April 16, 1986 letter, the City of Bakersfield owns property and has spreading and extraction facilities located in the proposed project area. The improved facilities, referred to as the "2800 acres," have demonstrated the capability of recharging and storing up to 200,000 acre feet of water per year. Through the efforts of the City, Olcese Water District, Buena Vista Water Storage District and the Kern County Water Agency, over 700,000 acre feet have been recharged since 1977. Therefore, it is of paramount importance that the City and its contractors receive full protection against any adverse conditions that might limit or restrict the recharge or extraction capability of the 2800 acre facility.

Since acquisition of the Kern River water rights and facilities from Tenneco in 1976, the City has been in the development phases of a long-term conjunctive use program involving extraction of City water previously stored in the 2800 acres for domestic use in urban Bakersfield. The short term plan includes the drilling of several potable quality water wells and construction of pipelines to a terminal storage tank located at the extreme western boundary of the urban area. Ultimately, additional wells and two large diameter pipelines would deliver finished water to areas east and north of the 2800 acre facility. These plans are predicated upon the use of excellent quality water used for recharge. Since State project water is of lesser quality than Kern River and Friant-Kern water, it is anticipated that massive recharge efforts outlined in the State plan could cause degradation of overall groundwater quality in the project area.

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Ms. Delores Brown
Page 2

We are concerned and therefore want to stress the importance of the State's intent to carefully monitor water quality, both before and after implementation of the proposed project. We also feel the proposed "In Lieu" recharge program suggested in the Draft E.I.R. would reduce the overall effect of importing large quantities of State water to a single area. The "In Lieu" concept would also provide additional flexibility to the State when local interests are recharging during normal or above-normal water years, thereby reducing potential competition for available "storage space."

In respect to the Tenneco lands that would be taken out of production, the proposed project lands are currently under contract with the City for supplying miscellaneous Kern River water to them. Under the same contract (No. 77-71, dated May 2, 1977), the City has the right to utilize Tenneco wells, canals and conveyance facilities in order to stabilize the City's water recharge program. The City would like to see a clarification of the State intention regarding this matter in the Final E.I.R. Our staff would be available to discuss this item at your earliest possible convenience.

Again, thank you for the opportunity to respond to the Draft E.I.R. regarding the proposed KERN WATER BANK project.

Very truly yours,

PAUL DOW
Community Services Manager

By *Gene Bogart*
Gene Bogart
Director of Water Resources

GB:sr

cc: Councilman Rollie Moore
Chairman, City Water Board
Councilman Donald K. Ratty
Councilman Mark Salvaggio
George Caravallho, City Manager
Tom Clark, Kern County Water Agency

Commenting Agency: City of Bakersfield, Community Service Department

- Response 1: It is the Department's intent to enter into agreements with KCWA and the City of Bakersfield to do this. The Department will consider these points as the project is refined, in consultation with local agencies.
- Response 2: The Department anticipates a small increase in TDS but the water quality would continue to meet drinking water standards and be suitable for agricultural and M&I uses. SWP water is generally equal to local ground water quality.
- Response 3: The Department and KCWA have begun the study of in-lieu projects for the Kern Water Bank program.
- Response 4: The Department would honor existing contractual obligations with the City on Tenneco lands. Furthermore, the Department will enter into an agreement with the City for joint operation of facilities.

PLANNING
DEPARTMENT



DEWEY DEANER
PLANNING DIRECTOR

CITY of
BAKERSFIELD

July 11, 1986

Delores Brown
Dept. of Water Resources
P.O. Box 942836
Sacramento, Ca. 94236-0001

RE: DEIR Kern Water Bank - SCH86031710

Dear Ms. Brown:

The City of Bakersfield Planning Department has reviewed the referenced DEIR and offers the following comments.

The proposed project provides both an opportunity and constraint. Opportunities occur for groundwater recharge, habitat enhancement and recreation. Constraints occur for urban development, transportation corridors, public utility corridors, agricultural production and mineral exploration.

The project location will redirect a trend of urban expansion southwest of Bakersfield. Growth will be forced in a north-south direction. As a result, the project will need to be coordinated with both City and County General Plans. **1**

The City's General Plan is completing a comprehensive update. Impacts which need more analysis include:

1. Reservation of transportation and utility corridors through the project area. **2**
2. Availability of recreation in the project area including habitat enhancement, preservation of endangered species, water sports, parks and golf courses. **3**

1501 TRUXTON AVENUE • BAKERSFIELD, CALIFORNIA 93301 • (805) 326-3733

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3. Reservation of drilling islands for oil extraction. **4**
4. Transition zone between future urban development and project boundaries. **5**

Thank you for the opportunity to comment. Please send me a copy of the FEIR and add the Planning Department to your mailing list for review of future documents.

Sincerely,

Barry Hand
Barry Hand
Principal Planner

BH:pjt

Commenting Agency: City of Bakersfield, Planning Department

- Response 1: Implementation of the proposed project would contain growth in the City of Bakersfield to a north-south direction. However, there is enough open space between the existing City limit and the Kern Water Bank boundary to accommodate the urban expansion projected in the existing General Plan. The City is currently updating its General Plan to the year 2010. The new plan may show the shape of Bakersfield extending more toward the southwest. If such a trend does occur, the Department would work with the City to develop a transition zone, such as a golf course, park or preserve to minimize any abrupt changes where the project borders urban areas.
- Response 2: The Department will work with the City to retain transportation and utility easements through the project area.
- Response 3: The areas not used for spreading facilities will be allowed to revert to native vegetation. Such reversions would be beneficial to the ecosystem and particularly important for the preservation of endangered species. Opportunities for additional recreational activities such as private duck clubs and bird watching will be considered in developing a land use plan.
- Response 4: The mineral rights to be purchased by DWR and those to be retained by TWI will be negotiated as a part of the land purchase agreement. Prior to purchasing the TWI property, the Department will negotiate the mineral rights on the property.
- Response 5: The Department intends to work with the City of Bakersfield and other interests on the development of a land use plan. The Department is interested in establishing a transition zone for the reasons mentioned in response 1, as well as, to minimize potential problems in the urban areas which may be created by mosquitoes.

BELBRIDGE WATER STORAGE DISTRICT

POST OFFICE BOX 1087
BAKERSFIELD, CALIFORNIA 93302
TELEPHONE: BCKTTRCH (805) 785-7318

July 11, 1986

DIRECTORS
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WILLIAM C. KUNS
ENGINEER
P.O. Box 2206
BAKERSFIELD, CA 93303

Mr. David N. Kennedy, Director
Department of Water Resources
P.O. Box 942836
Sacramento, Ca. 94236-0001

Dear Mr. Kennedy:

Thank you for the opportunity to comment on the Draft Environmental Impact Report for an Artificial Recharge and Overdraft Correction Program in the Kern River Fan Area, Kern County, California (Kern Water Bank).

The Belridge Water Storage District supports the concept of a Kern Water Bank for the addition of yield to the State Project and looks forward to the completion of studies that will determine the feasibility of the proposed project.

This letter transmits our comments on the Draft Environmental Impact Report.

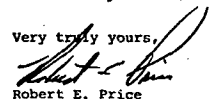
1. In the second paragraph under the heading "Purpose and Need for Action" on page S-1. The statement "It is the purpose of the proposed project to maximize the use of the ground water basin, giving priority to conservation of local water supplies" appears, and the last paragraph on page 15 states "Recharge of SWP water may be terminated during periods in which project recharge facilities are being used by other agencies to recharge excess Kern River flows. Local Kern River water could have first priority for spreading in wet and above normal years to minimize Kern River Intertie outflow." These statements indicate that owners of Kern River water rights will have a priority to storage rights in the project. We believe that the local interests should be able to participate in both the costs and the benefits of the project; however, unless the Kern River water to be spread is to become SWP water, as does

water that flows into the Intertie, it should not have a priority.

2. The report shows that the spreading areas should be located in the northern and eastern portions of proposed area. Therefore, there seems to be little value in purchasing the lands south of the Taft Highway and Alternate 1 should be seriously considered.

We would like to compliment the Department on the preparation of the Report, and again thank you for the opportunity to comment. Our comments are meant to be constructive and we believe the proposed project has the potential for benefits to both the Project contractors and local interests.

Very truly yours,


Robert E. Price
Engineer-Manager

Commenting Agency: Belridge Water Storage District

Response 1: Local and State facilities are planned to be used in a coordinated manner with operating costs balanced periodically.

Response 2: The amount of land required to operate an effective ground water program will be based on the results of the technical studies

Semitropic Water Storage District

BUTTONWILLOW IMPROVEMENT DISTRICT
POND-POSO IMPROVEMENT DISTRICT
P.O. BOX 2
WASCO, CALIFORNIA 93280
TELEPHONE (805) 768-5113 • 227-7144
July 11, 1986

Department of Water Resources
P. O. Box 942836
Sacramento, CA 94236-0001

Attention: Delores Brown

Re: Draft EIR dated May, 1986
Kern Water Bank

Gentlemen:

We appreciate the opportunity to review and provide comments on your above referenced Draft EIR. Considering the relatively short time period and the size of the project, your Department did a commendable job in presenting the concepts of the proposed banking plan in a rather clear and concise manner. We have also noted rather broad support of the concepts in our local community as well as within our district.

As you know, the Kern County Water Agency is submitting more detailed comments which we have also reviewed and generally concur with. The following comments are as they more particularly pertain to our District.

It is noted that the DEIR briefly mentions and provides for In-Lieu ground water banking as something that may be added to the project at some later date. In our opinion your report should go further in emphasizing its importance and should provide for early feasibility studies and inclusion in the overall banking plan.

Although a number of different forms of In-Lieu Banking Plans have been discussed locally, it is our opinion that the most effective and complete program is the concept of the Flat Rocks Canal together with similar and perhaps related programs. The Flat Rocks Canal and its service area would be beneficial not only to a number of local entities but also would provide additional project yield and would provide a number of mitigation measures for potential operational and other problems mentioned in the DEIR. In-Lieu Banking, together with the Kern Banking Plan, as discussed in the DEIR, would provide the following

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distinct benefits:

1. Operational flexibility to move water to other areas when the Kern Fan is either filled up or congested with other water which may have priority such as Kern River water.
2. Mounding of ground water or lack of additional storage could be mitigated more effectively.
3. Water could be placed into underground storage much more efficiently and more effectively by turning wells off over a larger area throughout the ground water basin. Areas adjacent to the Kern Fan perhaps have even more storage room than the Fan itself does.
4. It would broaden the support for the Kern Banking Plan in that the local benefits would be spread over a larger area.
5. Certain aspects of an In-Lieu Banking Program could be implemented at a much earlier date than a surface spreading program. As an example, Semitropic Water Storage District could start taking water for banking purposes in 1987 and could, to some extent, produce yield the following year by transfer of entitlement even before additional facilities are constructed.

In-Lieu banking with Semitropic Water Storage District could be in two forms: (1) by surface water service to landowners currently pumping ground water and then a transfer of State Water entitlement in dry years and, (2) surface water service to lands currently using wells and then actual pumping of ground water either directly to local State Water users or into the aqueduct in dry years. Under the first form above we propose to expand our existing distribution system and in the second form facilities such as the Flat Rocks Canal and a well field would have to be constructed.

In our opinion, the Flat Rocks Canal should be constructed essentially at zero invert slope such that it could be used to convey ground water from wells scattered along the canal and at various points within its service area back into the State system in water deficient years.

An underground water storage program, whether by surface spreading or by surface water service in lieu of ground water pumping, is as viable as a program using surface storage reservoirs, provided limitations are placed on ground water extractions which protect ground

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water elevations and water quality. Whenever levels and quality drop below certain base standards, extractions must be stopped or curtailed in some way.

Much more could be said about the merits of In-Lieu Banking, however, in the interest of limiting comments we offer whatever assistance might be needed to conduct appropriate studies.

In summary, Semitropic Water Storage District simply suggests that the In-Lieu Banking be given as high priority as surface spreading in developing the Kern Banking Plan, and the DEIR should be revised to permit its development at the earliest possible date.

Sincerely yours,



Wilmar L. Boschman
Engineer-Manager

WLB:mr

Commenting Agency: Semitropic Water Storage District

- Response 1: Pre-feasibility studies for potential direct and in-lieu projects will proceed concurrently with other project studies.
- Response 2: Pre-feasibility studies of all proposed direct and in-lieu recharge projects may demonstrate the need for other canals such as the Flat Rocks Canal. State facilities will be designed to accommodate future expansions.
- Response 3: These issues recommend a change in the project for other than environmental reasons. The Department recognizes that an in-lieu program will increase operational flexibility, reduce ground water pumpage, and provide broader support. It would not necessarily reduce proposed mounding or be implemented earlier than interim recharge operations.

Kern Delta Water District

DIRECTORS

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 STANLEY ANTUNOVICH, Treasurer
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 LUCIA EVANS, Asst. Tax Collector - Asst. Secy.

P.O. Box 180
 DEL. KERN STATION
 BAKERSFIELD, CALIFORNIA 93307
 Telephone 805-834-6854

LAW OFFICES OF
 GENE S. MCINTYRE

BOYLE ENGINEERING
 Consulting Engineers



July 9, 1986

Department of Water Resources
 P.O. Box 942836
 Sacramento, CA 94236-0001

RE: Comments on DEIR
 Kern Water Bank Project

Gentlemen:

Thank you for the opportunity to comment on the Draft Environmental Impact Report for an "artificial recharge, storage and overdraft correction program in the Kern River fan area, Kern County, California (Kern Water Bank)". It is noted at the outset that, while the DEIR is dated "May, 1986", the same was not available for review by this District until some time after June 10, 1986. Accordingly, these comments are hastily drafted. While this District is conceptually in favor of a project such as that described in the DEIR, we also feel that such a project, in light of its potentially far reaching impacts, should not be hastily pursued.

The comments which we have been able to develop in the time allowed are as follows:

1. **Groundwater Impact on Kern Delta:** At page 7 of the DEIR a statement is made as follows: "Credit for the overdraft reduction will be assigned to the Project and could be used for mitigating adverse impacts of the Project." Again, at page 16, it is noted that imbalances in annual extractions may be offset by benefits resulting from the removal of certain agricultural lands from production. This District does not endorse the concept that groundwater savings resulting from the Project should be "credited" to the Project and/or available to the Department of Water Resources for future use. Otherwise, there is no groundwater reduction benefit associated with the Project.

2. **Impact on Kern River Water Rights of Kern Delta:** A portion of the lands included in the proposed Project are situated within the boundaries of the historical public utility service areas of the Stine and the Buena Vista Canal Companies. Kern Delta

Kern Delta Water District

Department of Water Resources
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 Page 3

5. **Impact on Buena Vista Canal Operation:** Since the Buena Vista Canal may continue to be utilized for delivery of Kern River water to areas currently served by said Canal but south of and not included within the Project, and since the losses experienced in connection with said deliveries will be spread over a smaller service area, the operation of said Canal after the Project will be less efficient and result in greater per capita costs to the individuals continuing to receive utility water service from said Canal. This impact has not been addressed. A potential mitigation measure would be the utilization of the Buena Vista Canal in connection with the Project as a recharge facility (as hereinafter described) and/or the providing of make-up water to this District.

6. **In Lieu Participation:** As noted hereinafter, this District believes that the Project will better serve the interests of the Department of Water Resources with less adverse impact to the groundwater basin and the County of Kern if in lieu and/or recharge operations are cited on the south side of the Kern River Channel as well as on the north side of said Channel. We agree with the comment made at page 1 of the DEIR that subsequent programs require separate feasibility studies and EIRs before proceeding. We suggest that the Department of Water Resources add to its list of potential in lieu programs one involving the Kern Delta Water District.

7. **Buena Vista Canal Recharge Project:** At page 12 it is stated that the recharge basins contemplated by the Project would likely be concentrated in the northern and eastern portions of the Project site where the most permeable soils are found. Then, at page 21, it is noted that: "The spreading area or areas would be located so as to distribute recharged water over a significant portion of the Project site and to minimize local water level rises near the facilities." (Emphasis Added). We believe that the spreading facilities contemplated by the Project should not be concentrated in one location, particularly when such location may conflict with existing facilities such as the City of Bakersfield's 2800 acre spreading area and the spreading facilities of Rosedale-Rio Bravo Water Storage District. In lieu, at least in part, of concentrating spreading facilities in the northern and eastern portions of the Project site, it is suggested that a recharge facility be developed within the southerly portion of the Buena Vista Canal utility service area. These lands have been depicted as suitable for recharge purposes on previous United States Geological Survey Maps. In addition, existing facilities can be utilized, with some improvement, to distribute water to the recharge area. For example, a new

Kern Delta Water District

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Water District, as successor in interest through mesne conveyances of the Kern River water right of these two companies will retain such right, and/or waters of the Kern River attributable thereto, after implementation of the Project. Those lands within the utility service areas which are removed from agricultural production as a result of the Project will be deemed to have abandoned the utility service rights currently enjoyed. This Project should not contemplate, however, that any of the Kern River water which might otherwise have been delivered to said lands will be delivered instead to the Department of Water Resources, the Kern County Water Agency, or any other person, entity or organization. It is the intention of Kern Delta Water District to retain and utilize, for the benefit of the District and its landowners, all waters accruing to the said Kern River water right now and after implementation of the Project.

3. **Impact on Revenues of Kern Delta Water District:** The DEIR addresses the financial impact of the Project on the County of Kern making reference to property tax reductions at page 75. Consideration might likewise be given to the financial impact upon this District which will necessarily result from the removal from agricultural production (and water service) of 8,000 to 12,000 acres. For example, the District would expect to experience significant reductions in standby charge, zone of benefit and administrative charge revenues.

4. **Impact on Local Banking and Storage Programs:** At page S-1 it is stated: "It is the purpose of the proposed Project to maximize the use of the groundwater basin giving priority to conservation of local water supplies." (Emphasis Added). We agree with this concept and would emphasize the need to prioritize existing and future programs designed to improve storage of local water supplies and/or water supplies imported by local public agencies. We are concerned that proper consideration is not being given in this Project to such priority. For example, at page 15 the following appears: "Local Kern River water could have first priority for spreading in wet and above-normal years to minimize Kern River intertie outflow." (Emphasis Added). Again, at page 21, the following appears: "The Project would also be operated in coordination with the recharge facilities of other agencies to insure that the recharge of locally available water could continue with minimum interference" (Emphasis Added). We believe that a stronger statement of protection for the spreading of local Kern River water and locally available water is needed. We also believe that the protection should be expanded to include waters imported by local public agencies.

Kern Delta Water District

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turnout from the California Aqueduct might be installed in the vicinity of the Buena Vista Aquatic Recreation area; water might be distributed therefrom into the Aquatic Lake, through the Aquatic Lake into the Maples Canal, and via the Maples Canal to the Buena Vista Canal. Since most of the facilities are already in existence, some cost savings should result from implementation of this Project. Also, the ability of the Department of Water Resources to deliver State water into the southerly portions of the Kern Delta Water District creates exchange possibilities whereby the Department of Water Resources could acquire Kern River water for delivery to other spreading facilities and/or to other local public agencies.

8. **Local Control:** This District prefers local control of the Project operation and/or maximum local participation in the decision making process for Project operations. Alternative No. 3 identified at page S-3 is an alternative wherein the Kern County Water Agency would be the owner and operator of the Project facilities. We believe that Alternative 3 is preferable whether or not the Agency is the appropriate local agency to exercise "local control".

9. **Negative Bank Account:** Some of the discussion at pages 16, 21 and 22 indicates that the Department of Water Resources might pump water from the groundwater basin in advance of recharge and, in so doing, create a "negative bank account". This District opposes said concept. In addition, we believe that the extraction privilege should be limited to a percentage of that which has been recharged. That portion of the recharged water which is dedicated to the groundwater basin represents nonrecoverable supplies and operational losses. The extraction percentage might also reflect credit for displaced local storage resulting from the Project. If this were the case, the extraction percentage would be "floating". It might be calculated on a five or ten year running average based on actual experience as determined by monitoring activities.

10. **Table 5:** Table 5 at page 47 purports to describe existing groundwater recharge at the City of Bakersfield's spreading facility. This District does not verify the accuracy of the numbers set forth in Table 5 and, by failing to comment further thereon, does not wish to indicate agreement with the numbers presented.

11. **Recharge Rates:** At page 12 of the DEIR the recharge rate is specified at 0.5 acre feet per acre per day in the

Department of Water Resources
Attention: Delores Brown
July 9, 1986
Page 5

Project area. We understand that this figure may be inaccurate and may, in fact, overstate the recharge rate by as much as 100%. Under such circumstances, it is advisable that the Department of Water Resources investigate additional recharge areas such as that heretofore described in the Buena Vista Canal utility service area.

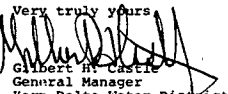
12. Storage Limitation: At page 14 the usable groundwater storage capacity is said to be one million acre feet. Since this figure is not precise, and in order to protect local storage and recharge programs, this District feels it would be appropriate for the Department of Water Resources to limit its access to a specified maximum storage amount or, alternatively, agree as heretofore noted that no Project storage will impact or replace local storage. If this were expressed as part of the extraction percentage, excess storage by the Department would simply be dedicated to local storage and displaced water that local entities would otherwise store would be turned over to the Department of Water Resources.

13. Indirect Deliveries/Individual Pumping: At page 21 the DEIR states that "some water could be delivered indirectly to adjacent water agencies by groundwater outflow from the Project area. This water could be pumped by individuals within those agencies." We have several questions arising out of this proposal. For example, what is considered to be "adjacent"? How will the decision be made respecting agencies that must accept their State Project water in place underground? How would extractions be measured and monitored? We believe that a great deal of thought and investigation must be given to this proposal before it can be implemented.

Department of Water Resources
Attention: Delores Brown
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Again, thank you for the opportunity to comment upon the Draft Environmental Impact Report. We look forward to working with the Department of Water Resources in resolving the concerns of all respective local public agencies and implementing a safe and beneficial project.

Very truly yours,


Gilbert R. Castle
General Manager
Kern Delta Water District

cc: Mr. Dan Schmidt
Boyle Engineering Corp.
cc: Gene R. McMurtrey, Esq
Kern County Water Agency

Commenting Agency: Kern Delta Water District

- Response 1: The overdraft reduction that would result from this project will be recognized in the contract negotiations with KCWA.
- Response 2: This comment raises a legal issue rather than an environmental issue. The Department will be examining this. It is not the intent of the Department to take local water as a part of the project yield.
- Response 3: Kern Delta Water District could lose about \$14.50 per acre as a result of removing 8,000 to 12,000 acres from agricultural production (\$12.00 per acre from reduced water sales revenues plus \$2.50 per acre from foregone district zone of benefit taxes). The total annual financial loss would be about \$116,000 for 8,000 acres removed and \$174,000 for 12,000 acres. If the water that is delivered to the acreages within the purchase area is sold elsewhere, then this impact would be reduced.
- Response 4: Impacts on local banking and storage projects and similar issues will be resolved in the contract with KCWA.
- Response 5: The development of a direct or in-lieu recharge program is being discussed with Kern Delta WSD and would eliminate this possibility.
- Response 6: The Department is considering in-lieu projects outside of Tenneco lands as appropriate. These include operations north and south of the Kern River channel.
- Response 7: The Department is investigating putting some of the facilities within the Buena Vista Canal service area. Recharge facilities will be dispersed to the extent that infiltration characteristics and economic considerations permit.
- Response 8: This comment raises institutional issues rather than environmental issues. These issues will be addressed in the contract with KCWA.
- Response 9: The Department's intent is to withdraw only imported SWP water. The contract that will be negotiated between the Department and KCWA shall specify the manner in which the maximum amount of water to be extracted and the maximum rate of extraction from elements of the Kern Water Bank in any one year shall be determined. Water may be extracted only to the extent that is was stored previously. The possibility remains that subject to agreement of all parties, the SWP could store water previously purchased by other agencies.
- Response 10: These numbers were obtained from KCWA and the City of Bakersfield.
- Response 11: The Department is investigating possible recharge facilities in the Buena Vista Canal service area. The recharge rate of 0.5 feet per day is believed to be obtainable on the better land with good O&M practices. A rate of 0.25 feet per day may be appropriate on poorer lands.
- Response 12: The Department's limit to access to a specified maximum storage amount for each project will be by agreement with KCWA. Coordination with adjacent recharge facilities will provide an opportunity to recharge local water for local storage using State facilities.

Response 13: Adjacent water agencies would be those with a common boundary with State Project facilities. No agency will be required to accept in-ground delivery of SWP water; however, some may agree to do so. The methods for measuring and monitoring extractions are not yet defined.



ESTABLISHED IN 1918 AS A PUBLIC AGENCY

COACHELLA VALLEY WATER DISTRICT

POST OFFICE BOX 1054 • COACHELLA, CALIFORNIA 92236 • TELEPHONE (619) 386-2551

DIRECTORS
WILFRED R. RAMMOSCH, PRESIDENT
WILLIAM COOPER, VICE PRESIDENT
JOHN P. POWELL
BILL W. MICHELL
THEODORE J. FISH

OFFICERS
THOMAS E. LEVY, GENERAL MANAGER-CHIEF ENGINEER
RENAUDINE BUTTON, SECRETARY
KEITH H. ARMBRIST, ASSISTANT GENERAL MANAGER/AUDITOR
KEITH AND BRIDGELL, ATTORNEYS

July 8, 1986

Dolores Brown
Department of Water Resources
Post Office Box 942836
Sacramento, California 94236

Dear Ms. Brown:

Subject: Artificial Recharge, Storage and Overdraft
Correction Program in Kern River Fan Area,
Kern County, California (Kern Water Bank)

Thank you for an opportunity to comment on the Kern Water Bank Environmental Impact Report.

While we are very supportive of conjunctive use programs, we believe that the proposed program may be too limited in scope and suggest that the program should be expanded to increase the yield to the State Water Project possibly through the use of Central Valley Project water or local supply. In addition, we believe that under the proposal as defined in the draft EIR, substantial local benefit will occur without the beneficiaries paying their proportionate share for their benefits. We believe that they should pay for any benefits or the State should retain the benefits. 1 2

As we have indicated before, we believe that it is necessary to review the feasibility studies currently being performed in order to accurately comment on the EIR. We are looking forward to reviewing the feasibility study and hope that it will address the above comments.

It appears that substantially more land than is justifiable under the program described in the Draft Environmental Report is being proposed for purchase. The feasibility study may provide additional rationale which would justify the purchase of this land. 3

If you have any questions, please contact me.

Yours very truly,

Tom Levy

Tom Levy
General Manager-Chief Engineer

TEL:ra

cc: Dave Schuster
State Water Contractors

TRUE CONSERVATION
USE WATER WISELY

Commenting Agency: Coachella Valley Water District

- Response 1: The acquisition of CVP water to enhance the yield of the SWP is being pursued through other Department programs. The CVP water would not be used in the Kern Water Bank. The right to use local supply is held by local interests.
- Response 2: The sharing of benefits and costs will be subject to negotiation once a specific project is identified.
- Response 3: The Department is conducting further studies to investigate the recharge suitability of all lands being offered by Tenneco. The amount of land acquired as a buffer zone will be limited to that necessary to operate the ground water recharge program while minimizing adverse impacts to adjacent land owners.

Office Memorandum • KERN COUNTY

TO : Department of Water Resources
Planning Branch
Attn: Donald J. Finlayson
DATE: June 23, 1986

FROM : Public Works Department
Karen Cutsforth for Skip Tullock
Telephone No.

SUBJECT: DEIR - ARTIFICIAL RECHARGE, STORAGE & OVERDRAFT CORRECTION PROGRAM
IN KERN RIVER FAN AREA (KERN WATER BANK)

We have reviewed the subject project submitted to this office on June 20, 1986, and concur with your finding. We have no further comments.

ST:KC:sg

PWS 560 1157 06-0000 10x 1-84

Commenting Agency: Kern County Public Works

No response is needed.

GERMAN SHORTHAIRED POINTER CLUB
OF SOUTHERN CALIFORNIA, INC.

July 13, 1986

Delores Brown
Department of Water Resources
P.O. Box 942836
Sacramento, CA 94236-0001

Dear Ms. Brown:

The German Shorthaired Pointer Club of Southern California, Inc.
would like to urge the inclusion of a Field Trial and Dog Training
Area within the proposed Oneill Forebay Oroville Facility. 1

Dog clubs are finding increasing difficulty in obtaining
areas suitable for the holding of field trials and for training
purposes. We would appreciate consideration in this area.

Sincerely,

Catherine N. Black
Catherine N. Black
President

**Commenting Agency: German Shorthaired Pointer Club of Southern California,
Incorporated**

Response 1: The areas not used for spreading facilities will be allowed to revert to native vegetation. Some of the buffer areas will be available for recreational activities as well as wildlife enhancement. Compatible activities will be given high consideration in development of a land use plan.

California Brittany Club

July 12, 1986

Department of Water Resources
P. O. Box 942836
Sacramento, Ca. 94236-0001

Attention: Delores Brown

Subject: Kern Water Bank

I am writing on behalf of the California Brittany Club to request that the Department of Water Resources include Field Trials for dogs as one of the activities that can be held in the Kern Water Bank area. It is our understanding that unless it is designated for field trials at the outset along with the other activities, these activities may not be held. Precedence has already been established and dog trial events are presently held at two other water Bank/Recreation areas, those being at Santa Nella and Oroville, California.

In the recent past the areas used for field trials has been diminishing and enough real estate has been hard to find. It would help our club and others like it tremendously if we could be included as one of the activities to be held on the Kern Water Bank.

Thank you for your consideration.

Very truly yours,

Larry N. Marsh

Larry N. Marsh
3767 Coolheights Drive
Rancho Palos Verdes, Ca. 90274

Commenting Agency: California Brittany Club

Response 1: The areas not used for spreading facilities will be allowed to revert to native vegetation. Some of the buffer areas will be available for recreational activities as well as wildlife enhancement. Compatible activities will be given high consideration in development of a land use plan.



MERRELL KENNELS

training class gun dogs for competition and pleasure.

July 10, 1986

Ms. Delores Brown
Dept. of Water Resources
P. O. Box 942836
Sacramento, Calif. 94236-0001

Dear Ms. Brown,

Regarding land near Bakersfield, We would appreciate your consideration of allowing us to hold Bird Dog Field Trials on this land similar to conditions at O'Neill Forebay in Santa Nella and Thermalito Afterbay near Oroville.

Our local San Joaquin German Shorthaired Pointer Club holds two trial (AKC) each year and one NGSPA Championship. We have around 100 entries in each of these with participation from people all over the state. It has become increasingly difficult to find land for these events,

Sincerely,

John Merrell
John Merrell, President
San Joaquin German Shorthaired Pointer Club

3761

Weggs Avenue, Room 162, Bakersfield, California 93308/2 Phone (805) 589-3333

Commenting Agency: Merrell Kennels

Response 1: The areas not used for spreading will be allowed to revert to native vegetation. Some of the buffer areas will be available for recreational activities as well as wildlife enhancement. Compatible activities will be given high consideration in developing a land use plan.

**NORTHERN
BRITTANY**

Member of American Brittany Club, Inc.



**CALIFORNIA
CLUB, Inc.**

Sponsors of the Brittany Spaniel

P. O. Box 586
Lockeford, Calif., 95237
July 8, 1986

Dept. of Water Resources
P. O. Box 942836
Sacramento, Calif., 94236-0001
ATTN: Delores Brown

Dear Ms. Brown:

It has been brought to the attention of the Northern California Brittany Club that your department is purchasing land to establish the Kern County Water Bank.

This Brittany Club wishes to go on record requesting that your office will give attention to the clubs and people that hold Field Trials in California. It is getting more difficult to find areas large enough to hold regional trials let alone attract National Trials.

Thank you for your cooperation and consideration you may extend to our Club and others who would like to utilize the grounds for trials.

Sincerely,
I. Helen Brown
I. Helen Brown, Secretary

Commenting Agency: Northern California Brittany Club, Inc.

Response 1: The areas not used for the spreading facilities will be allowed to revert to native vegetation. Some of the buffer areas will be available for recreational activities as well as wildlife enhancement. Compatible activities will be given high consideration in the development of a land use plan.

2/9/86

DOLOR'S BROWN
DEPT. OF WATER RESOURCES
P.O. BOX 942836
SACRAMENTO, CALIF. 94236-0001

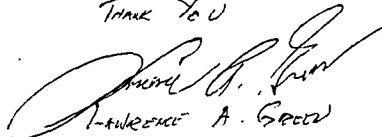
DEAR MISS BROWN

REFERENCE PROJECT KERN WATER BANK.

IT IS REQUESTED THAT AN AREA BE SET
ASIDE IN THIS AREA THAT WOULD ACCOMMODATE
FIELD TRIALS & TRAINING OF BIRD DOGS.
& THAT THE SIZE BE SUITABLE FOR THESE
EVENTS

WOULD APPRECIATE KNOWING WHAT ACTION
YOU TAKE IN THIS REGARD.

THANK YOU


LAWRENCE A. GREEN
PRES. OF GSPOF S.C.
125 KELLUM DR
WALNUT CREEK, CAL. 94591

Commenting Individual: Lawrence A. Green

Response 1: The areas not used for spreading will be allowed to revert to native vegetation. Some buffer areas will be available for recreational activities as well as wildlife enhancement. Compatible activities will be given high consideration in developing a land use plan.

George W. Nickol, Jr.

6800 Lake Ming Road
Ski Route 4, Box 801
Bakersfield, CA 93306
Telephone 805/872-5050

June 25, 1986

Donald J. Finlayson
Chief Planning Branch
Department of Water Resources
P.O. Box 388
Sacramento, CA 95802

Dear Don:

In preparation for your Public Hearing tonight at the Kern County Farm Bureau office of the draft Environmental Impact Report, I am writing this note to make some comments on the draft EIR. Before doing so, I would like to set forth my background and involvement in this general subject matter.

I was a very direct participant in bringing into being the Kern River Water Rights and Storage Agreement of 1962. The same thing can be said regarding the water conservation storage purchase in Isabella Reservoir from the United States and also for the River Canal Agreement, which made feasible storage of Buena Vista Water Storage District water in Isabella Reservoir rather than in Buena Vista Lake. I also conceived and assisted in bringing about the Taterie between the Kern River and the California Aqueduct. Furthermore, I had direct responsibility for the development of the Buena Vista Lake area from a storage water facility to the highly efficient farming operation that now exists in that area. In regard to the development of the farming operations in the Buena Vista Lake area, there was a definite need to develop a full water supply; consequently, I spearheaded the program to develop feasible groundwater, a program which proved to be difficult and short of our objectives. Consequently, I had engineering studies made to determine if water spreading operations along the Kern River between Bakersfield and Tugman would create feasible recharge for our Buena Vista Lake area wells. For your information, I learned that water spreading for recharge can be very efficient along the route of the Kern River and, to a substantial extent, north and northwest of the Kern River, but definitely not to the Buena Vista Lake area or even to points south of the Taft Highway. Based upon the preliminary findings of the State Engineers, I believe that the general conclusion is being made that on the Temeco lands there is not a satisfactory recharge potential south of the Taft Highway. Based on these findings, I suggest that your alternative #1 entitled "North of Taft Highway Recharge Project" will be the potentially most efficient purchase of Temeco land. I don't believe the land south of the Taft Highway even has any particular benefit as a buffer zone.

As noted above, I have substantial knowledge of the spreading efficiency of the lands along the Kern River between Bakersfield and Tugman. I utilized this knowledge in working with the City of Bakersfield following its purchase from Temeco of what is now referred to as the 2800 acre spreading area. I worked out a program with the City to spread Kern River water in the City's spreading area for subsequent recovery and use in the Olcese Water District, a large part

June 25, 1986
Page 2.

of which is now in the City of Bakersfield. In addition, I worked out an exchange program with the Buena Vista Water Storage District to take pumped water from the City's spreading area in exchange for like amounts of Buena Vista's Kern River water released from Isabella Reservoir. Since initiation of this program, the City has made extensive use of its spreading area for its own Kern River water and has also permitted the Buena Vista District to do likewise, and, in more recent times, a program has been worked out with the Kern County Water Agency. I think it can be stated without any question that the City's 2800 acre spreading area is a fine, efficient project that must be given absolute, unqualified protection in any program that the State may have for water regulation in Kern County. I suggest that the State and the Kern County Water Agency should respect and work toward this objective of full protection. I also suggest that there may be a simple way in doing so. As long as the rights of this City and its Contractors are recognized on both water extraction and spreading, the difficulties of spreading State and other water on adjacent Temeco lands can be overcome. Specifically, I suggest that recognition should be given to the full right of extraction of all water stored in the City's spreading area at the time that the proposed State Project is initiated. The engineering staff of the City Water Board has very complete water spreading records that can be made available for this purpose. I next suggest that after the Temeco lands are acquired, it will be desirable to combine into a total spreading and recovery program the Temeco lands with the City's 2800 acres. Under such an arrangement, it should be specifically spelled out that the City and its contractors can spread, without additional cost, their owned water in either the City spreading area or on the Temeco lands, wherever it is determined that spreading will be most efficient at any particular time. Thereafter, it will be understood that the City and its contractors can recover from wells in the City's spreading area their total spread water, whether it be in the City's 2800 acre area, or on the adjacent Temeco lands.

To get this overall program under operation, I have a further important suggestion for your consideration, as well as that of MWD and other State M&I Aqueduct Contractors. The simplest way to get this program off of dead center would be for MWD, et al, to make a water purchase in Kern County of sufficient magnitude to provide the funds that will be necessary to purchase the Temeco lands and install required facilities thereon. In order for such a sale of available Kern County water to take place, it will be, in my opinion, necessary for the water selling entities to first bring into Kern County sufficient surplus Aqueduct and Friant/Kern Canal water to balance the withdrawals of water that will be made by MWD, et al. To insure that the surplus Aqueduct water is available, MWD, et al, can stipulate that surplus water in their Aqueduct contracts will be made available to the Kern County sellers at the incremental cost of transportation from the Delta to Kern County. This will work no hardship on MWD, et al, and will, in my opinion, make this project a feasible one.

I have much more to add on how to make this overall program feasible, but will do that in subsequent letters to you.

Sincerely,

George W. Nickol, Jr.

GWN:rjp

Commenting Individual: George Nickel, Jr.

- Response 1: The amount of land required to operate an effective ground water program will be based on the results of the technical studies.
- Response 2: The amount of land acquired as a buffer zone will be limited to that necessary to operate the ground water recharge program while minimizing adverse impacts to adjacent land owners.
- Response 3: It is the intent of the Department to enter into an agreement with the City of Bakersfield for joint operation of facilities. The 2,800 acre spreading area will be fully protected.
- Response 4: The Department will recognize the full right of extraction of all water stored in the City's spreading area at the time the State's project is initiated.
- Response 5: The Department agrees that the operation of the City's 2,800 acres and any future recharge program implemented by the State should be coordinated to maximize the recharge and recovery of water placed in the ground water basin. The Department intends to enter into an agreement with the City to assure this.
- Response 6: This is unnecessary as the State Water Project's bonding capacity will be used and will result in cost savings from lower interest rates.

**Table 12. MAJOR CHANGES TO THE KERN WATER BANK PROGRAM
EIR**

DEIR Page	FEIR Page	Change
iii	iii	New text added to Paragraph 3 of Foreword .
S-1	1	Text deleted in Paragraph 2.
S-1	1	Text added, Purpose and Need for Action section.
S-2	2	Text added, Description of the Proposed Action section.
S-3	6	Text added, Alternative 2 .
1	9	Paragraph 5, changed East Side Canal to Cross Valley Canal.
2	10	Text changed.
9	17	Paragraph 4, text added.
12	20	Paragraph 1, text added.
13	21	Last sentence of Project Facilities section deleted.
13	21-22	Text added Project Operation section.
15	23	Paragraph 1 of DEIR deleted.
15	23	Text added.
16	23	Figures 6-9 of the DEIR were replaced with 6A/B-9A/B in the FEIR.
16	32	Text delete, Recharge and Extraction section.
16	--	SWP Delivery Capability section deleted.
23	34	Text changed, Project Cost section.
37	47	Paragraph 1, text added.
41	50	6 sensitive plants added.
43	53	Table 4a added.
46	56	Text changed, Land Use section.
54	66	Paragraph 3, text added.
57	68	Ground Water Conditions changed to Ground Water Effects .
57	68	Text Changed, Ground Water Effects section.
64	75	Paragraph 4, text added.
73	83	Paragraph 5, text added.
75	85	Paragraph 3, text changed.
85	95	Text added, Alternative 2 .
86	96	Text added, Alternative 5 .
-	109	New Chapter added.
-	188	Table 12 added.

CONSULTATION AND COORDINATION

The following agencies or individuals were contacted regarding the preparation of the EIR.

Kern County Water Agency	- Tom Clark
Kern Mosquito Abatement District	- Harmon Clemont, Manager
Leedshill-Herkenhoff, Inc.	- Jim Jenks and Bob Sverak
State Water Contractors	
Tenneco West Incorporated	- Bill Balch

State of California

Department of Conservation	- Hal Bopp
Department of Fish and Game	- Rod Goss and Mike Mulligan
Department of Food and Agriculture	- John Troianos and Craig Thompson
Department of Parks and Recreation	
Water Resources Control Board	- Bob Ford and Oscar Balaguer

United States

Soil Conservation Service	- Dave Durham
---------------------------	---------------

Other Agencies

California Waterfowl Association	- Dan Chapin
Kern County Parks and Recreation	
Westside Mosquito Abatement District	- Sid Ryall, Manager, and Don Black

LIST OF PREPARERS

The Draft Environmental Impact Report on the Artificial Recharge, Storage and Overdraft Correction Program in the Kern River Fan Area, Kern County, California

was prepared by the

Department of Water Resources, Division of Planning

Arthur C. Gooch, Chief, Division of Planning

The report was prepared under the direction of

Don Finlayson, Chief, Planning Branch

The principal preparers were:

Delores Brown, Environmental Specialist IV

Steve Cowdin, Research Program Specialist I

Terry Erlewine, Associate Engineer

John Fielden, Associate Engineering Geologist

Dave Hitzeman, Supervising Engineer

Dale Hoffman-Floerke, Environmental Specialist III

Editorial and Production Services were provided by:

Earl G. Bingham, Research Writer

Dave LaBrie, Editorial Technician

Travis Latham, Research Writer

Susan Tatayon, Editorial Technician

GLOSSARY

-A-

Acre-foot--The quantity of water required to cover one acre to a depth of one foot; equal to 43,560 cubic feet or 325,851 gallons.

Adjudicated Ground Water Basin--A ground water basin in which the rights to pump ground water have been determined by the courts.

Applied Water--The quantity of water delivered to the intake of a city's water system, the farm headgate, the factory, and, for wildlife, the amount of water supplied to a marsh or other wetland, either directly or by incidental drainage flows.

Aquifer--A geologic formation that stores and transmits water and yields significant quantities of water to wells and springs.

Artificial Recharge--The addition of water to a ground water reservoir by human activity, such as irrigation or induced infiltration from streams, wells, or recharge basins. See also GROUND WATER RECHARGE, RECHARGE BASIN.

Average Yield--Total computed SWP annual deliveries that could have been made from October 1921 through September 1978, divided by the total years (57) in the study period.

-B-

Base Study--operation study without the proposed project.

Benefits--Net increase in the value of goods and services which result from the project, as compared to conditions without the project.

Below Normal Years--Years in which the four-river runoff is below the normal value, as defined by the SWRCB D-1485.

Bioaccumulation--The uptake of substances from the environment, other than food. Generally, the uptake of environmental pollutants.

Botulism--acute food poisoning caused by the toxin produced by the spore forming bacterium Botulinus.

Brackish Water--Water containing dissolved minerals in amounts that exceed normally acceptable standards for municipal, domestic, and irrigation uses. Considerably less saline than sea water.

-C-

Carriage Water--Delta outflow required to protect the quality of water at the CVP and SWP pumping plants.

Closed Basin--A basin whose topography prevents visible surface outflow of water. It is considered to be hydrologically closed if neither surface nor underground outflow of water can occur.

Confined Aquifer--A water-bearing stratum that is bounded above and below by formations of impermeable, or relatively impermeable, material.

Conjunctive Operation--The operation of a ground water basin in coordination with a surface water storage and conveyance system. The purpose is to recharge the basin during years of above-average water supply to provide storage that can be withdrawn during drier years when surface water supplies are below normal.

Conservation Facility--A reservoir, either surface or ground water, that is used to capture or store water during wet periods for later use.

Coordinated Operating Agreement--An agreement between the United States Bureau of Reclamation and the Department of Water Resources to coordinate the operation of their projects including storage, releases and pumping.

Corcoran Clay--Widespread geologic unit in the San Joaquin Valley that greatly restricts the vertical movement of ground water. It serves as a confining layer separating deep and shallow ground water systems.

Critical Dry Period--A series of water-deficient years, usually an historical period, in which a full reservoir storage system at the beginning is drawn down to minimum storage at the end without any spill.

Critical Dry Year--A dry year in which the full commitments for a dependable water supply cannot be met and deficiencies are imposed on water deliveries.

-D-

Decision 1485--A set of regulations formulated by the California State Water Resources Control Board to protect the beneficial uses in the Delta. They include, among other factors, determination of maximum salinity concentrations at different locations in the Delta.

Deep Percolation--The percolation downward of water past the lower limit of the root zone of plants.

Delta Water Charge--A charge to water service contractors under the water service contract used in the State Water Project. The Delta water charge to a particular contractor is intended to recover the portion of the cost of the water conservation facilities allocated to that contractor.

Dependable Supply (Water)--The annual quantity of water that can be delivered under normal water supply conditions, and with allowable deficiencies during critical dry periods. See also CRITICAL DRY YEAR, FIRM YIELD, PROJECT YIELD.

Desalting--A process that converts sea water or brackish water to fresh water or an otherwise more usable condition through removal of dissolved solids. Also called "desalination."

Detailed Analysis Unit (DAU)--The smallest study area used in the analysis of water use and supply, generally defined by hydrologic features or boundaries of organized water service agencies. In the major agricultural areas, a DAU typically includes 100,000 to 300,000 acres.

Double Cropping--The practice of producing two or more crops consecutively on the same parcel of land during a 12-month period. Also called multi-cropping.

Drainage Basin--The area of land from which water drains into a river; as, for example, the Sacramento River Basin, in which all land area drains into the Sacramento River. Also called, "catchment area," "watershed," or "river basin."

-E-

Endangered Species---Any species which is in danger of extinction throughout all or a significant portion of its range, other than a species of *Class Insecta* determined by the Secretary to constitute a pest whose protection under the provisions of the Endangered Species Act would present an overwhelming and overriding risk to man.

Entitlement Water---Water from the State Water Project that has been contracted for under long-term agreements. The SWP contracts establish specific annual entitlement amounts that each long-term water contractor may request. These schedules reflect each contractor's estimate of future water needs at the time the contracts were signed (with some subsequent revisions).

Environment---The sum of all external influences and conditions affecting the life and development of an organism or ecological community; the total social and cultural conditions that influence the life of an individual or community.

Evapotranspiration---The quantity of water transpired (given off) and evaporated from plant tissues and surrounding soil surfaces. Quantitatively, it is expressed in terms of volume of water per unit acre or depth of water during a specified period of time. Abbreviation: ET.

Extraction---The process of removing water from the ground by means of pumps.

-F-

Firm Yield---The maximum annual supply of a given water development that is expected to be available on demand, with the understanding that lower supplies will occur in accordance with a predetermined schedule or probability. See also DEPENDABLE SUPPLY, PROJECT YIELD.

-G-

Ground Water---Water that occurs beneath the land surface and completely fills all pore spaces of the alluvium or rock formation in which it is situated.

Ground Water Basin---A ground water reservoir, together with all the overlying land surface and the underlying aquifers that contribute water to the reservoir. In some cases, the boundaries of successively deeper aquifers may differ and make it difficult to define the limits of the basin.

Ground Water Mound---An area under rivers, percolation ponds or other features which recharge ground water and where water levels are raised.

Ground Water Overdraft---The condition of a ground water basin in which the amount of water withdrawn by pumping exceeds the amount of water that replenishes the basin over a period of years.

Ground Water Recharge---Increases in ground water by natural conditions or by human activity. See also ARTIFICIAL RECHARGE.

Ground Water Reservoir---An aquifer or an aquifer system in which ground water is stored. The water may be placed in the aquifer by artificial or natural means.

Ground Water Storage Capacity---The space contained in a given volume of deposits. Under optimum use conditions, the usable ground water storage capacity is the volume of water that can, within specified economic limitations, be alternatively extracted and replaced in the reservoir.

Ground Water Table--The upper surface of the zone of saturation (all pores of subsoil filled with water), except where the surface is formed by an impermeable body.

-H-

-I-

In-lieu Recharge Projects--The process of providing surface water to a user who normally pumps ground water in return for cessation of that pumping. In effect recharge is accomplished by not removing water from storage.

-K-

Kriging--A statistical method for estimating aquifer properties between points where measurements are available.

-L-

Land Subsidence--The lowering of the natural land surface in response to: earth movements; lowering of fluid pressure; removal of underlying supporting materials by mining or solution of solids, either artificially or from natural causes; compaction caused by wetting (hydrocompaction); oxidation of organic matter in soils; or added load on the land surface.

Leaching--The flushing of salts from the soil by the downward percolation of water.

Liquefaction--A condition in which certain soils may become fluid in response to earthquake shaking.

-M-

Milligrams Per Liter--The weight in milligrams of any substance dissolved in one liter of liquid. Nearly the same as parts per million. Abbreviation: mg/L

-N-

-O-

Operation Study--Simulated monthly operation of the SWP and CVP based on historic hydrology.

Operational Year--October 1 through September 30. (See WATER YEAR).

Overdraft--See GROUND WATER OVERDRAFT.

-P-

Perched Ground Water--Ground water supported by a zone of material of low permeability located above an underlying main body of ground water with which it is not hydrostatically connected.

Percolation--The downward movement of water through the soil or alluvium to the ground water table.

Permeability--The capability of soil or other geologic formation to transmit water.

Piezometer--A well used for measuring water levels.

Project Yield--The water supply attributed to all features of a project, including integrated operation of units that could be operated individually. Usually, but not always, it is the same as firm water yield. See also DEPENDABLE SUPPLY, FIRM YIELD.

-R-

Rafting--The use by waterfowl of ponded areas that are inaccessible to hunters.

Recharge--see Ground Water Recharge

Recharge Basin--A surface facility, often a large pond, used to increase the infiltration of water into a ground water basin.

Return Flow--The portion of withdrawn water that is not consumed by evapotranspiration and returns instead to its source or to another body of water.

Riparian--Of, or on the banks of, a stream or other body of water.

Riparian Vegetation--Vegetation growing on the banks of a stream or other body of water.

Rule Curve--Minimum carryover storage requirement needed in the system reservoirs to meet scheduled demands and other required releases.

Runoff--The surface flow of water from an area; the total volume of surface flow during a specified time.

-S-

Salinity--Generally, the concentration of mineral salts dissolved in water. Salinity may be measured by weight (total dissolved solids), electrical conductivity, or osmotic pressure. Where sea water is known to be the major source of salt, salinity is often used to refer to the concentration of chlorides in the water. See also TOTAL DISSOLVED SOLIDS.

Seiches--Waves created in a lake or pond in response to earthquake shaking.

Selenium--A naturally occurring non-metallic element found in local soils.

Semiconfined Aquifer--An aquifer whose properties are similar to a confined aquifer when pumped for a short period of time but whose properties approach those of an unconfined when pumping continues for a long period of time.

Service Area--The geographical land area included in the distribution system of a water agency.

Spreading Basin--See Recharge Basin

Spreading Grounds--See Recharge Basin

Subsidence--See Land Subsidence

Surface Supply--Water supply from streams, lakes, and reservoirs.

Surplus Water--As used in this report, the term refers to developed State Water Project water supplies in excess of contract entitlement water.

-T-

Table A Entitlement--Annual SWP water entitlements as defined in Table A of the SWP water service contracts. See **Entitlement Water**. (Also listed in Table B-4 of DWR Bulletin 132).

Threatened Species--Any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

Total Dissolved Solids--A quantitative measure of the residual mineral dissolved in water that remain after evaporation of a solution. Usually expressed in milligrams per liter. Abbreviation: TDS. See also **SALINITY**.

-U-

Unconfined Aquifer--An aquifer in which the upper surface is in direct contact with the atmosphere.

Usable Storage Capacity--Ground water storage capacity that is capable of yielding water to wells economically and of being readily recharged.

-V-

-W-

Water Quality--A term used to describe the chemical, physical, and biological characteristics of water, usually in regard to its suitability for a particular purpose.

Water Reclamation--The treatment of water of impaired quality, including brackish water and sea water, to produce a water of suitable quality for the intended use.

Water Right--A legally protected right to take possession of water occurring in a water supply and to divert that water for beneficial use.

Water Table--See **GROUND WATER TABLE**.

Water Year--A continuous 12-month period for which hydrologic records are compiled and summarized. In California, it begins on October 1.

Wetlands--Lands where the soil or substrate is at least periodically saturated with or covered by water, and where saturation with water is the dominant factor determining the nature of soil development and the types of plants and animal communities living in the soil and on its surface.

Williamson Act--Otherwise known as the California Land Conservation Act, provides property tax relief to land owners who contract with local government to maintain their land in agricultural usage for a minimum of 10 years.

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APPENDICES

APPENDIX 1

1906-86 D-1485 WATER YEAR CLASSIFICATION

FOUR RIVERS RUNOFF IN 1000 AF

YEAR	AJRO	WYRO	WET	ABOVE NORMAL	BELOW NORMAL	DRY	CRITICAL	SNOWMELT
1986	5,358	25,735	W	*	*	*	*	SUB
1985	3,958	10,992	*	*	*	D	*	*
1984	5,518	22,351	W	*	*	*	*	SUB
1983	13,658	37,686	W	*	*	*	*	*
1982	11,734	33,324	W	*	*	*	*	*
1981	3,631	11,098	*	*	*	D	*	*
1980	5,996	22,326	W	*	*	*	*	*
1979	5,641	12,409	*	*	*	D	*	*
1978	8,067	23,926	W	*	*	*	*	*
1977	1,927	5,125	*	*	*	*	C	*
1976	2,726	8,081	*	*	*	*	C	*
1975	8,953	19,234	*	A	*	*	*	*
1974	9,777	32,495	*	*	*	*	*	*
1973	6,381	20,047	W	*	*	*	*	*
1972	5,023	13,426	*	*	B	*	*	SUB
1971	8,896	22,572	W	*	*	*	*	*
1970	4,353	24,058	W	*	*	*	*	SUB
1969	10,681	26,980	W	*	*	*	*	*
1968	4,116	13,640	*	*	B	*	*	SUB
1967	11,015	24,059	W	*	*	*	*	*
1966	4,837	12,950	*	*	B	*	*	SUB
1965	8,132	25,663	W	*	*	*	*	*
1964	4,375	10,921	*	*	*	D	*	*
1963	10,091	22,993	W	*	*	*	*	*
1962	6,235	15,115	*	*	B	*	*	*
1961	4,387	11,972	*	*	*	D	*	*
1960	4,649	13,057	*	*	B	*	*	SUB
1959	3,836	12,049	*	*	*	D	*	*
1958	12,241	29,710	W	*	*	*	*	*
1957	6,294	14,889	*	*	B	*	*	*
1956	8,602	29,887	W	*	*	*	*	*
1955	5,066	10,983	*	*	*	D	*	*
1954	6,812	17,428	*	A	*	*	*	*
1953	8,260	20,086	W	*	*	*	*	*
1952	13,676	28,600	W	*	*	*	*	*
1951	5,418	22,947	W	*	*	*	*	SUB
1950	6,721	14,442	*	*	B	*	*	*
1949	5,586	11,970	*	*	*	D	*	*
1948	9,546	15,754	*	A	*	*	*	*
1947	3,826	10,388	*	*	*	D	*	*
1946	5,972	17,621	*	A	*	*	*	*
1945	5,921	15,063	*	*	B	*	*	*
1944	4,934	10,433	*	*	*	D	*	*
1943	6,897	21,125	W	*	*	*	*	*
1942	9,931	25,236	W	*	*	*	*	*
1941	9,770	27,079	W	*	*	*	*	*
1940	6,928	22,434	2	2	*	*	*	*
1939	3,038	8,180	*	*	*	*	C	*
1938	12,933	31,826	W	*	*	*	*	*
1937	7,237	13,331	*	*	B	*	*	*
1936	6,406	17,351	*	A	*	*	*	*
1935	9,690	16,587	*	A	*	*	*	*
1934	2,452	8,630	*	*	*	*	C	*
1933	4,664	8,938	*	*	*	*	C	*
1932	6,237	13,116	*	*	2	2	*	*
1931	2,089	6,096	*	*	*	*	C	*
1930	4,652	13,518	*	*	2	2	*	SUB
1929	3,835	8,400	*	*	*	*	C	*
1928	5,859	16,762	*	A	*	*	*	SUB
1927	8,750	23,834	W	*	*	*	*	*
1926	4,792	11,765	*	*	*	D	*	*
1925	6,511	15,993	*	A	*	*	*	*
1924	1,936	5,736	*	*	*	*	C	*
1923	6,271	13,206	*	*	B	*	*	*
1922	10,568	17,981	*	A	*	*	*	*
1921	7,523	23,801	W	*	*	*	*	*
1920	4,909	9,199	*	*	*	*	C	*
1919	6,773	15,656	*	*	B	*	*	*
1918	4,889	10,995	*	*	*	D	*	*
1917	9,139	17,260	*	A	*	*	*	*
1916	8,885	24,141	W	*	*	*	*	*
1915	11,415	23,857	W	*	*	*	*	*
1914	10,076	27,811	W	*	*	*	*	*
1913	6,288	12,847	*	*	B	*	*	*
1912	5,645	11,410	*	*	*	D	*	*
1911	13,119	26,381	W	*	*	*	*	*
1910	6,114	20,117	W	*	*	*	*	*
1909	8,985	30,681	W	*	*	*	*	*
1908	5,604	14,772	*	*	B	*	*	SUB
1907	13,449	33,704	W	*	*	*	*	*
1906	12,923	26,706	W	*	*	*	*	*
AVE	7,038	16,283						

TYPICAL YEAR	YEAR FOLLOWING CRITICAL
*****	*****
W	W
*****	22.5
19.6	*****
A	A
*****	*****
15.7	***** 15.7
B	D
*****	*****
12.5	***** 12.5
D	*****
*****	*****
10.2	***** C
C	*****

NOTES:

AJRO = APRIL JULY RUNOFF
WYRO = WATER YEAR RUNOFF
2 = TWO YEAR CRITERIA
APPLIES IN THIS YEAR
SUB = AJRO LESS THAN 5.9 HAF
IN W, A, OR B YEARS
12/86 RHZ

California
Archaeological
Inventory

Information
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Tulare

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ARCHAEOLOGICAL RECORDS SEARCH

Project: Record Search for the Dept. of Water Resources

Location: T. _____ R. _____ Sections: _____

U.S.G.S. Quads.: Tupman, Millux, Mouth of Kern, Stevens

Requested by: Department of Water Resources

P. O. Box 388

Sacramento, Calif. 95802 Phone 209-445-5278

Environmental Setting:

☒ Valley Floor ☐ Foothills ☐ Mountains ☐ Desert ☐ Other

Previous Studies: There have been five prior investigations on
or within project boundary. (See continuation sheet)

Recorded Archaeological Sites: There are eighteen recorded sites on
or within project boundary. These sites consist of beads, flakes
handtools, projectile points, bowl fragments, housepits and burials.

Archaeological Sensitivity: ☒ High ☐ Moderate ☒ Low

Reason: High is due to known sites in project boundary. Low is
due to lack of known sites and prior impacts.

The Following Actions Are Recommended:

☐ No additional action is necessary unless cultural materials are located during any construction or development of area.

☒ Whether or not an EIR is required, a field survey is required to determine if any cultural resources are present.

Additional Comments and Recommendations: Known sites and environmental
setting make a survey necessary for this project, plus the study
conducted by Mr. Wallace is more of a literature search rather than
a actual foot survey.

Robert A. Schiffman, Coordinator
South Central Information Center

By: Evelyn Brown
Title: Staff Assistant

Date: 4-9-86

APPENDIX 2 (cont.)

Continuation Sheet

Millux Quad -

1. Wallace, William 1971 - Archaeological Investigation at Buttonwillow Water Management Project.

Stevens Quad -

1. Schiffman, R. 1976 - Archaeological Survey for the Ten Section Oil Field.
2. Ancient Enterprise 1979 - Archaeological Resources Assessment of the Proposed Alternate Rts. for Gosford Intertie Pipeline.
3. Wallace, William 1971 - See Wallace above.

Tupman Quad -

1. Wallace, William 1979 - See Wallace above.
2. Woodward, J. 1983 - Proposed Capture Pen and Buried Telephone Lines.
3. Ancient Enterprise 1979 - See Ancient Enterprise above.
4. McManus, J. 1985 - Archaeological Survey Report for Proposed Widening Project 06-Ker-119, PM 14.9/19.8 254400.